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ABSTRACT

The document is the last of a five-part series focusing in minute detail on the processes involved in the formulation of an instructional systems development (ISD) program for military interservice training that will adequately train individuals to do a particular job and which can also be applied to any interservice curriculum development activity. It presents a summary and model of the Interservice Procedures for Instructional Systems Development (IPISD) and an overview of its application and management focusing on response to local needs. The functional phases of ISD include: (1) Analyze, (2) Design, (3) Develop, (4) Implement, and (5) Control. The difference between ISD and other instructional forms is discussed as well as the foundation of ISD and its benefits. The major part of the document (133 pages) covers a detailed outline of the five phases and their related steps. Each step is discussed in the light of: rationale, inputs, processes, outputs, and management decision. A list of references is included for each phase. (Author/EC)

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INTERSERVICE PROCEDURES FOR INSTRUCTIONAL SYSTEMS DEVELOPMENT:

EXECUTIVE SUMMARY AND MODEL

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1 August 1975

Prepared for:

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THE MODEL

THE FIVE PHASES ARE:

PHASE I
ANALYZE

Inputs, processes, and outputs in Phase I are all based on job information. An inventory of job tasks is compiled and divided into two groups: tasks not selected for instruction and tasks selected for instruction. Performance standards for tasks selected for instruction are determined by interview or observation at job sites and verified by subject matter experts. The analysis of existing course documentation is done to determine if all or portions of the analysis phase and other phases have already been done by someone else following the ISD guidelines. As a final analysis phase step, the list of tasks selected for instruction is analyzed for the most suitable instructional setting for each task.

PHASE II
DESIGN

Beginning with Phase II, the ISD model is concerned with designing instruction using the job analysis information from Phase I. The first step is the conversion of each task selected for training into a terminal learning objective. Each terminal learning objective is then analyzed to determine learning objectives and learning steps necessary for mastery of the terminal learning objective. Tests are designed to match the learning objectives. A sample of students is tested to insure that their entry behaviors match the level of learning analysis. Finally, a sequence of instruction is designed for the learning objectives.

PHASE III
DEVELOP

The instructional development phase begins with the classification of learning objectives by learning category so as to identify learning guidelines necessary for optimum learning to take place. Determining how instruction is to be packaged and presented to the student is accomplished through a media selection process which takes into account such factors as learning category and guideline, media characteristics, training setting criteria, and costs. Instructional management plans are developed to allocate and manage all resources for conducting instruction. Instructional materials are selected or developed and tried out. When materials have been validated on the basis of empirical data obtained from groups of typical students, the course is ready for implementation.

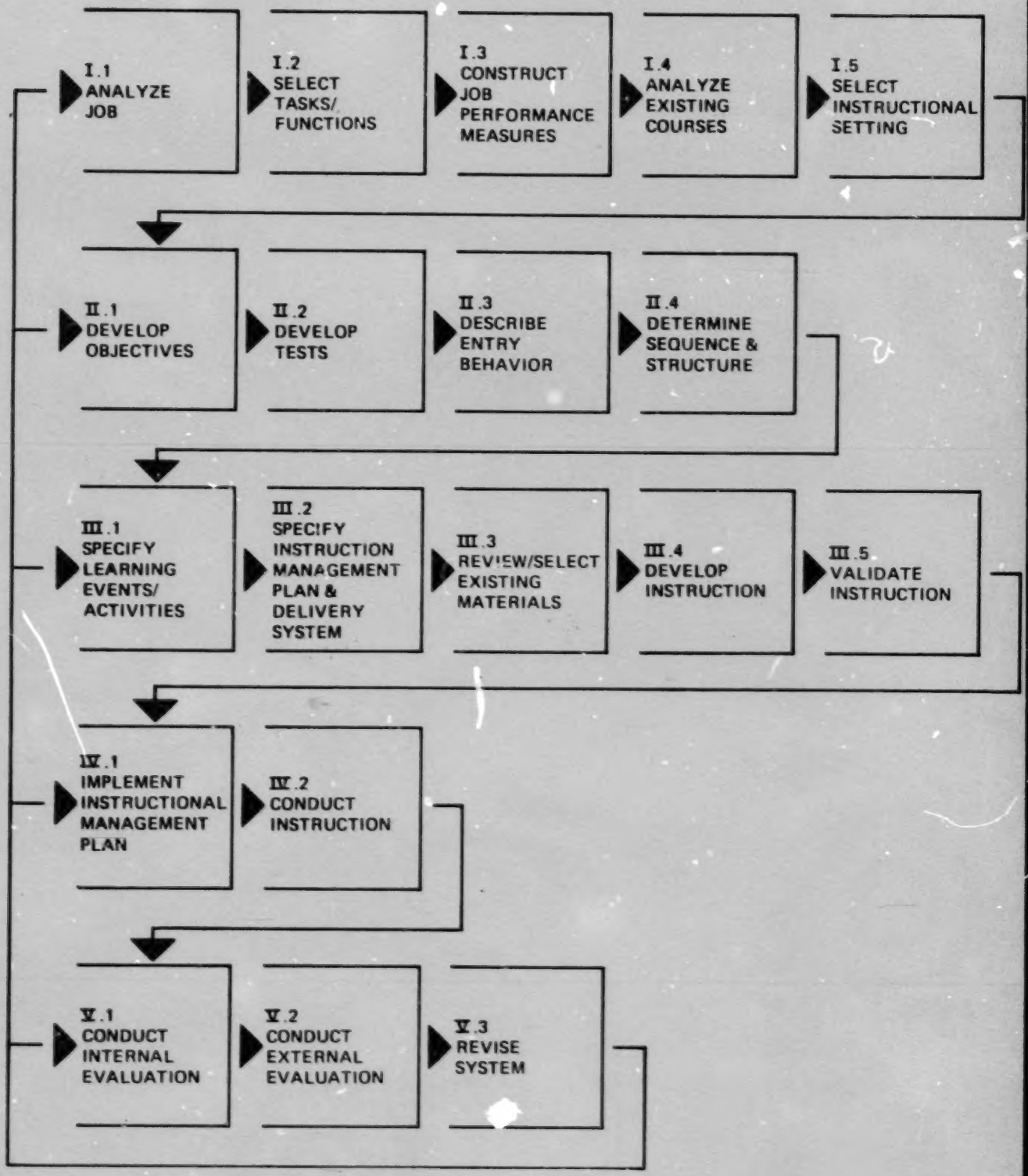
PHASE IV
IMPLEMENT

Staff training is required for the implementation of the instructional management plan and the instruction. Some key personnel must be trained to be managers in the specified management plan. The instructional staff must be trained to conduct the instruction and collect evaluative data on all of the instructional components. At the completion of each instructional cycle, management staff should be able to use the collected information to improve the instructional system.

PHASE V
CONTROL

Evaluation and revision of instruction are carried out by personnel who preferably are neither the instructional designers nor the managers of the course under study. The first activity (internal evaluation) is the analysis of learner performance in the course to determine instances of deficient or irrelevant instruction. The evaluation team then suggests solutions for the problems. In the external evaluation, personnel assess job task performance on the job to determine the actual performance of course graduates and other job incumbents. All collected data, internal and external, can be used as quality control on instruction and as input to any phase of the system for revision.

THE BLOCKS IN EACH PHASE ARE:


I.1 ANALYZE JOB
I.2 SELECT TASKS/ FUNCTIONS
I.3 CONSTRUCT JOB PERFORMANCE MEASURES
I.4 ANALYZE EXISTING COURSES
I.5 SELECT INSTRUCTIONAL SETTING
II.1 DEVELOP OBJECTIVES
II.2 DEVELOP TESTS
II.3 DESCRIBE ENTRY BEHAVIOR
II.4 DETERMINE SEQUENCE & STRUCTURE
III.1 SPECIFY LEARNING EVENTS/ ACTIVITIES
III.2 SPECIFY INSTRUCTION MANAGEMENT PLAN & DELIVERY SYSTEM
III.3 REVIEW/SELECT EXISTING MATERIALS
III.4 DEVELOP INSTRUCTION
III.5 VALIDATE INSTRUCTION
IV.1 IMPLEMENT INSTRUCTIONAL MANAGEMENT PLAN
IV.2 CONDUCT INSTRUCTION
V.1 CONDUCT INTERNAL EVALUATION
V.2 CONDUCT EXTERNAL EVALUATION
V.3 REVISE SYSTEM

THE OUTCOMES OF THE BLOCKS ARE:

I

- **.1** . . . a list of tasks performed in a particular job.
- **.2** . . . a list of tasks selected for training.
- **.3** . . . a job performance measure for each task selected for instruction.
- **.4** . . . an analysis of the job analysis, task selection, and performance measure construction for any existing instruction to determine if these courses are usable in whole or in part.
- **.5** . . . selection of the instructional setting for task selected for instruction.

II

- **.1** . . . a learning objective for and a learning analysis of each task selected for instruction.
- **.2** . . . test items to measure each learning objective.
- **.3** . . . a test of entry behaviors to see if the original assumptions were correct.
- **.4** . . . the sequencing of all dependent tasks.

III

- **.1** . . . the classification of learning objectives by learning category and the identification of appropriate learning guidelines.
- **.2** . . . the media selections for instructional development and the instructional management plan for conducting the instruction.
- **.3** . . . the analysis of packages of any existing instruction that meets the given learning objectives.
- **.4** . . . the development of instruction for all learning objectives where existing materials are not available.
- **.5** . . . field tested and revised instructional materials.

IV

- **.1** . . . documents containing information on time, space, student and instructional resources, and staff trained to conduct the instruction.
- **.2** . . . a completed cycle of instruction with information needed to improve it for the succeeding cycle.

V

- **.1** . . . data on instructional effectiveness.
- **.2** . . . data on job performance in the field.
- **.3** . . . instructional system revised on basis of empirical data.

INTERSERVICE PROCEDURES FOR INSTRUCTIONAL SYSTEMS DEVELOPMENT:

EXECUTIVE SUMMARY AND MODEL

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PREFACE

This document, the Interservice Procedures for Instructional Systems Development: Executive Summary and Model is a description of the approved techniques and procedures to be followed in the development and conduct of interservice training. It was prepared under Contract Number N-61339-73-C-0150 between the Center for Educational Technology at Florida State University and the U.S. Army Combat Arms Training Board, Ft. Benning, Georgia. After the inception of the project, the Interservice Committee for Instructional Systems Development became the approving authority by agreement with the Army. This change in approving authority broadened the project's scope to include requirements from the Air Force, Marines, and Navy as well as from the Army.

THE MILITARY INTERSERVICE PROJECT FOR THE ESTABLISHMENT

OF

A STANDARDIZED PROCEDURE FOR INSTRUCTIONAL SYSTEMS DEVELOPMENT

In September 1972, the commanders of the four military training commands met in Washington to establish themselves as the Interservice Training Review Board (ITRB) for the purpose of promoting economies in training through the medium of consolidated interservice training programs. Through the agency of a set of committees, known as the Interservice Training Review Organization (ITRO), the ITRB addressed the areas of interservice curriculum development, training technology, cost accounting and terminology.

At its second meeting, in June 1973, the Committee on Terminology reached a unanimous conclusion that before the matter of common terminology could be adequately attended to, there was a requirement for a common system for the development of curricula to support the Curriculum Committee, after which the requirement for terminology would naturally result. The Committee therefore resolved to redirect its activities toward the goal of producing a process for instructional systems development which could serve as the procedures for any interservice curriculum development activity, with sub-objectives of designing an acceptable model, a procedural manual and a set of instructional programs which could be used to teach the procedures. The ITRB approved this change of mission at its succeeding meeting, and the Army Combat Arms Training Board offered the services of its recently executed contract with the Center for Educational Technology (CET), the Florida State University (FSU), as the agency for conducting the extensive work which

would be required in order to meet the objectives. All subsequent meetings of the Committee on Instructional Systems Development, as it became known, were held at the CET/FSU, the primary function of the Committee being to provide interservice guidance to the contractor as the full program developed. The Committee functioned under the broad direction of a chairman, chosen by vote, and all decisions were those agreed upon by a majority of the Committee, which consisted of membership representing each service's training commander.

After about one year of work by the contractor and many reviews by each of the four training command staffs, an Instructional Systems Development (ISD) model was approved by the Committee, and subsequently by the ITRB. This cleared the way for the development of the procedural manual, based upon the model, and the concomitant design of the instructional programs to teach the principles and processes embodied in the manual. Now the task is completed...the goal has been achieved, and the ITRO has available to it for purposes of building interservice consolidated curricula a model and supporting procedures which the Committee believes is a solid representation of the very best in the state-of-the-art of ISD, and which it hopes will serve to further the practice and precepts of instructional technology wherever high quality instruction is of primary importance.

ACKNOWLEDGMENTS

Substantial contributions to this and earlier versions of the Model were made by: Dr. Wallace H. Hannum, Dr. Barbara F. Johnson, and Ms. Linda Morse of the Florida State University.

Detailed reviews, critiques and recommendations were made by: LTC George Baker, Dr. Leslie Briggs, Dr. John Danilovich, Dr. William Deterline, Dr. Walter Dick, E. P. (Buddy) Evans, Dr. Duncan Hansen, Dr. Harold Hunter, Dr. Charles Jackson, C.C. Jeter, Dr. Roger Kaufman, LT Blaine Lee, Dr. C.L. John Legere, Dr. Angelo Mirabella, LTC Tim Plummer, Dr. Frank Sands, Carl Serger, James Sherrill, Dr. Robert Sulzen, Robert H. Summers, and Dr. John E. Taylor.

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LTC Jordine S. Von Wantoch of the Services School Command, NTC, San Diego, provided valuable assistance in arranging for tryouts of earlier versions of these manuals. CPT Frank Dowling of the U.S. Army Combat Arms Training Board, Ft. Benning, Georgia, provided similar assistance in tryouts at the U.S. Army Infantry School at Ft. Benning.

The following interservice sources supplied detailed critiques of earlier versions of the Model: U.S. Army Training and Doctrine Command, Chief of Naval Technical Training, Marine Corps Development and Education Command, Command and General Staff College, Army Service Schools and U.S. Air Force Air Training Command/XPTI.

INTERSERVICE PROCEDURES FOR INSTRUCTIONAL SYSTEMS DEVELOPMENT:

EXECUTIVE SUMMARY AND MODEL

INTRODUCTION

The Interservice Procedures for Instructional Systems Development (IPISD) are concerned primarily with the "how to do it" aspects of instructional systems development. In the overall management system context, the design and development of instruction necessarily must follow an adequate needs analysis. (See Figure 1.)

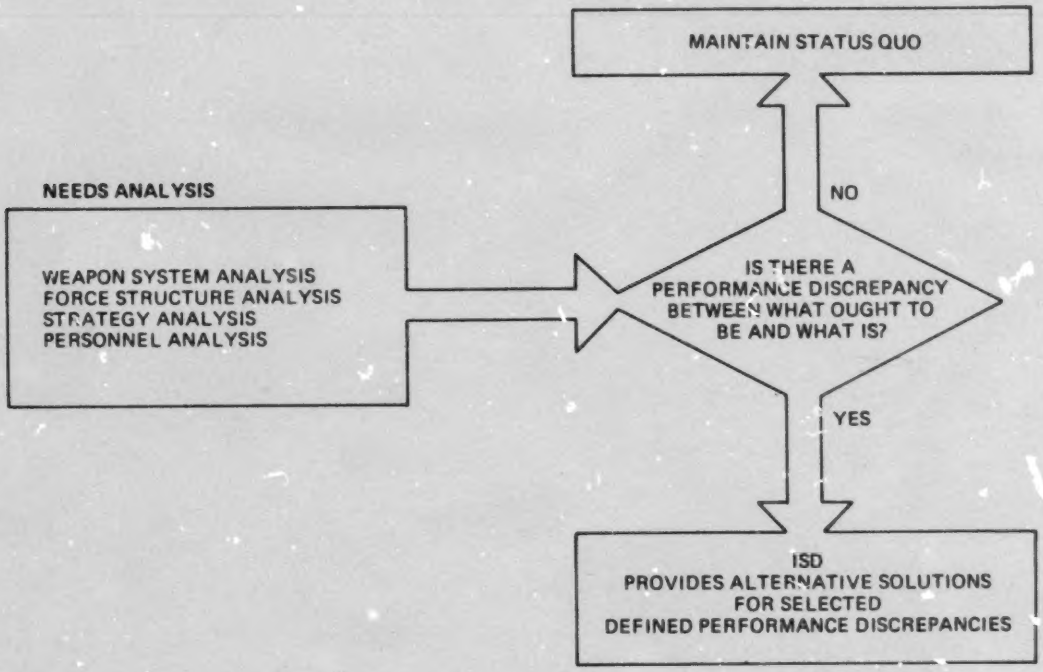


FIGURE 1: Relationship of ISD to Total System

In this context, the term "need" refers to a measurable discrepancy or distance between the actual world as it exists now and the world as it ought to be. Needs analysis must accurately reflect the world or system as it now is and must also define clearly the most desirable state of affairs. Discrepancies can be created through the discovery of new knowledge or the application of new technology; e.g., the availability of a new weapons system or through changes in the force structure brought about by changes in strategy, tactics, or changes in the military personnel system. For example, in the early 1970's, the reenlistment rate of combat experienced veterans remained at a moderate to low level. During the middle 1970's perhaps as a result of the general economic conditions or wide scale national attitudinal changes, combat veterans were reenlisting at a dramatically increased rate. Changes of this nature can have important implications for the training system as a whole.

Since the ISD procedures must follow the needs analysis, the quality of the information obtained in Phase I of the ISD procedures will have a strong impact on the success of the outputs of the ISD procedures. If a performance requirement is overdefined or underdefined based on analyses of field conditions, a new weapons system, or other source, the ISD procedures will tend to exaggerate the error. If training is specified where no training is required, resources will not be well managed. On the other hand, if no training is specified where training is an appropriate solution, the organizational mission could suffer drastically.

This volume contains the Executive Summary and Model of a five-phase manual which presents approved procedures and techniques for interservice

instructional systems development. It provides an introduction and overview to the application and management of ISD and describes the foundations upon which ISD is based.

Instructional systems development is the broad application of the systems approach to training. The model upon which this manual is based has five phases as shown in the fold-out at the beginning of this volume. Each of the phases is a separate and distinct function which could be carried out successively by one person, or each of the steps could be assigned to separate individuals.

The IPISD model is based on the following nine assumptions:

1. The mission of a military instructional system is to determine instructional needs and priorities, to develop effective and efficient solutions to achieving these needs, to implement these solutions in a competent manner, and to assess the degrees to which the output of the system meets the specified needs.
2. There are alternative approaches to the solution of instructional problems which are differentially responsive to specific environmental constraints found in the Armed Forces.
3. The existing large body of research and development in learning, instruction, and management techniques may provide the basis for significantly improved instruction.
4. A systems approach to the process and procedures of instruction is the most effective current means of evaluating, developing, and implementing these alternatives.

5. Regardless of the complexity of the job tasks to be performed, the instructional system should optimize the proportion of entering students who meet acceptable job task performance standards by the end of instruction.
6. Planned technical and management change in the operation of the instructional system will be a continuing requirement.
7. Individuals differ in their abilities, achievement, motivation and rate of learning and an instructional system must accomodate these differences to capitalize on the opportunity for increasing the effectiveness and efficiency of instruction.
8. Two or more equally successful alternative solutions can be found for any instructional problem, and these solutions will differ in cost.
9. Intensive and recurring training of managers and instructional developers in the application of The Interservice Procedures for Instructional Systems Development represents a direct first step toward achievement of this mission.

Based on these assumptions, this document describes the functions necessary to analyze instructional needs; design, develop, and implement instruction; and maintain quality control of instruction. This document also recommends a sequential relationship of these functional steps.

Phase I, ANALYZE, presents procedures for defining what jobs are, breaking these down into statements of tasks, and using numerical techniques to combine the best judgment of experienced professionals to select tasks for training. Phase I also presents processes for construction of

job performance measures and the sharing of occupational and training information within and among the services. It provides a rationale for deciding whether tasks should be trained in schools, on the job, or elsewhere, and also requires consideration of the interaction between training and career progression.

Phase II, DESIGN, of the manual deals specifically with the design aspects of the training program within selected settings. Design here is considered in the architectural sense in which the form and specifications for training are laid down in careful detail. Phase II reviews the considerations relating to entry behavior of two separate kinds: general ability, and prior experience. A rationale is presented for establishing requirements based on the realistic evaluation of both of these factors.

Phase III, DEVELOPMENT, refers to the actual preparation of instruction. Determinations are made about how the students shall be managed, the kinds of learning experiences they will have, the activities in which they will engage, and the form and content of the instructional delivery system. Techniques are presented for the careful review and adaptation of existing materials. Procedures for the systematic design of instruction which can be delivered in a variety of media are also included. Phase III terminates with a carefully developed procedure for testing and evaluating the instruction to insure that its performance meets expectations.

Phase IV, IMPLEMENTATION, specifically treats the necessary steps to implement the instruction according to the plan developed in Phase III. Two important steps highlight Phase IV, that of training the staff in the procedures and problems unique to the specific instruction and

actually bringing the instruction on-line and operating it. The Phase IV effort continues as long as there is a need for the instruction.

Phase V, CONTROL, deals with procedures and techniques for maintaining instructional quality control standards and for providing data from internal and external sources upon which revision decisions can be based. Data collection, evaluation of the data, and decision making about the implications of the data represent the three principal functions described in Phase V. Emphasis is placed on the importance of determining whether the trainees are learning what was intended, and upon determining whether what they have learned is of the expected benefit to the receiving command. A negative answer to either of these would suggest revisions in the content or procedures in order to make the instruction meet the need it is intended to serve.

How Does ISD Differ From Existing Practice

One way to indicate the difference between ISD and existing practices is to point out that there are currently a number of existing practices, some of which represent excellent applications of ISD. There are outstanding examples of well-conceived and delivered instruction available within the interservice training community. However, these efforts do not represent a very large fraction of the total interservice training establishment. One purpose of this manual is to establish interservice standards for the design, development and delivery of instruction which will meet state-of-the-art specifications.

An important difference between ISD and more traditional forms of instruction is that the ISD process, through occupational surveys and job analyses requires the thoughtful selection of what is to be trained based on solid job data from the field. This practice tends to insure

that training will be provided for those tasks most critical to adequate job performance, and that training will not be wasted on tasks which have a low probability of meeting immediate needs or critical long-term needs.

A second important difference between traditional schools and ISD procedures is the consideration of how training is to be conducted. The recent past has seen a number of innovations in approaches to training all of which are either as good or better than traditional methodology. The generation and application of alternative training methodology is required in the ISD process, it is not assumed that all training will be platform instruction.

A third critical difference between traditional practice and ISD is the ISD use of test data based on absolute standards of performance and the use of that data to grade students and to judge the quality of the instruction. There are specific objectives that courses are planned to meet, and ISD requires that courses be evaluated on their ability to meet those stated objectives, and be revised if they fail to do so.

Finally, the ISD process requires the application of modern technology to the fullest degree possible in order to optimize training effectiveness, efficiency and cost. Consideration is given to the relative value of training compared to its cost, and whether the output of the training system is worth the investment of time and resources required to produce that output. A unique feature which distinguishes ISD from more traditional approaches is that course time or cost reductions are brought about not by the elimination of content or the reduction of service but through the application of a technology to achieve expected

performance with fewer resources. The application of unit cost and unit time reduction techniques often have produced dramatic results.

Bases for ISD

Instructional systems development has grown out of basic research in three separate areas: management sciences, communication sciences, and behavioral sciences. Examples of basic research areas in the management sciences include: job analysis, occupational survey techniques, decision theory, cost effectiveness models, and computer technology.

From the communications sciences, research in communications, electronics, and media utilization have produced a wide variety of alternative techniques and procedures for accomplishing instructional objectives.

There are three important areas of research in the behavioral sciences which have yielded results that are useful in ISD. Learning research has provided a solid foundation for the design of alternative approaches to instruction. Measurement and evaluation of behavior has matured to the point that it is possible to have great confidence in the measurement and evaluation procedures. And, the recent past has seen a large variety of instructional design and management approaches which have yielded impressive results.

These contributions from the management, communications, and behavioral sciences allow for the development of ISD technology. The ISD process includes the capability for specific research and development to resolve existing problems. In addition, because it provides for so many alternatives to traditional forms of instruction, the ISD process allows for the analysis and use of existing research bases.

Potential Benefits of ISD

Based on a large number of successful demonstrations, there is now empirical evidence that competent use of the ISD approach can greatly improve training in at least three distinct ways:

1. Effectiveness. Through the design and development procedures, a careful selection of what is to be trained, the measurement and evaluation of training, and the revision of the training program until it meets its objectives should greatly increase training effectiveness.
2. Efficiency. Several military applications of ISD have indicated that effective instruction can be offered in a much more time-efficient way than has been true in the past. The application of ISD procedures to instruction in order to make it more time-efficient has paid off handsomely.
3. Costs. It is not reasonable to believe that the use of ISD procedures will always result in lower costs. It is unrealistic to expect lower costs per student on all existing completely effective courses. However, the ISD procedure does provide a systematic way of viewing costs of training and considering whether additional resources are justified in view of the output.

There have been many demonstrations that combinations of effectiveness, time-efficiency, and cost considerations have yielded impressive results, particularly when they have been considered in the context of making alternative investment decisions. Investments in technology for certain

long high-flow courses have demonstrated improvements in cost per student, time required to complete, and increased effectiveness. These results have been obtained on large systems which use advanced simulators and also in areas of training which use no hardware at all. The common element is the procedure and approach, not the hardware or equipment.

A vitally important management function is the accurate collection and use of cost data. Such data permit cost comparisons as soon as they are available, and, more importantly, make the conduct of cost-effectiveness studies more likely and their conclusions more accurate.

One cost model, produced by the Navy's Training Analysis Evaluation Group, called TECEP (Training Effectiveness and Cost Effectiveness Prediction) is suggested as a companion volume to the interservice manuals. The TECEP model, or an adaptation or improvement of it, can be used by local commands to accumulate and use cost data.

MAJOR COMPONENTS OF THE IPISD PACKAGE

The Interservice Procedures for Instructional Systems Development Package contains components essential to produce the coordinated effort between senior management, middle management, and individuals who work in ISD. The complete training package contains the following elements:

1. An Instructional Systems Development Executive Summary and Model with explanation and rationale is the introduction to the manuals.
2. A multivolume manual covers the procedures for instructional systems analysis, design, development, implementation and control.
3. An adjunct instructional workbook which is to be used in conjunction with the multivolume manual. The workbook contains practice exercises, forms, and procedures to be followed; methodology to be employed; and the necessary evaluation items to enable the student to do independent study.
4. Mediated workshop materials to be used either with individuals or groups. These will supplement the instructional program by teaching trainees the necessary knowledges and skills described in the model. These mediated workshop materials consist of slide/tape presentations combined with exercises from the adjunct workbook. Workshop instructors will provide regular feedback to the trainee on his progress in achieving the objectives.

5. A workshop directors handbook describes the procedural steps necessary to conduct short or longer term workshops utilizing elements 1, 2, 3, and 4. It contains suggested exercises, suggested methods for adapting the general procedures described in 1, 2, 3, and 4 to local conditions and situations, and contains additional evaluation instruments necessary for quality control.

The package is a combination of individual study, group study, and review materials, and is designed to accomodate a variety of learners and institutional requirements. The recommended situation, however, is for an individual first to attend a directed workshop with a group of other trainees. There he would receive practice exercises, orientation sessions, and informational presentations to enable him to grasp the general concepts of ISD. Further, he would be taught how to access and use the information contained in the multivolume manual, how to use existing referenced Armed Forces publications, and how to continue to improve his skills at the conclusion of the workshop.

Both the multivolume manual and the adjunct workbook contain references to significant existing publications dealing with the specific topics covered. Each of the Armed Forces has published manuals on procedures for the development of training, and each step in the Model utilizes references to specific publications available to the Armed Forces schools.

The multivolume manual serves the function of information storage; that is, as a set of reference works. The manual is designed in this fashion to enable individual commands to add specific books and manuals to its basic list of references in order to make the package

adaptable to local needs. The adjunct workbook is loose-leaf in format. Individual commands are urged to add or subtract materials, problems, and examples to meet local needs. The combination of the workbook and multivolume manual will be most useful to those individuals who have independent study skills.

The workshop slide/tape is organized to provide a guided overview for a workshop briefing or individual learning center setting. The package can also be used in combination with instructors for larger numbers of individuals. The training workshops teach the use of the multivolume manual and rely on the adjunct workbook for the provision of practice exercises and self-evaluation.

These workshops provide either intensive training in specific areas contained in the ISD manuals, or a complete overview of the Model and its elements for those individuals having need for a more general level of knowledge.

The last element in the package is a workshop directors handbook which contains administrative instructions for each of the components of the IPISD package. It also contains practice exercises and suggested instructional development problems for which alternative solutions are available and which can be designed as case studies in a workshop setting.

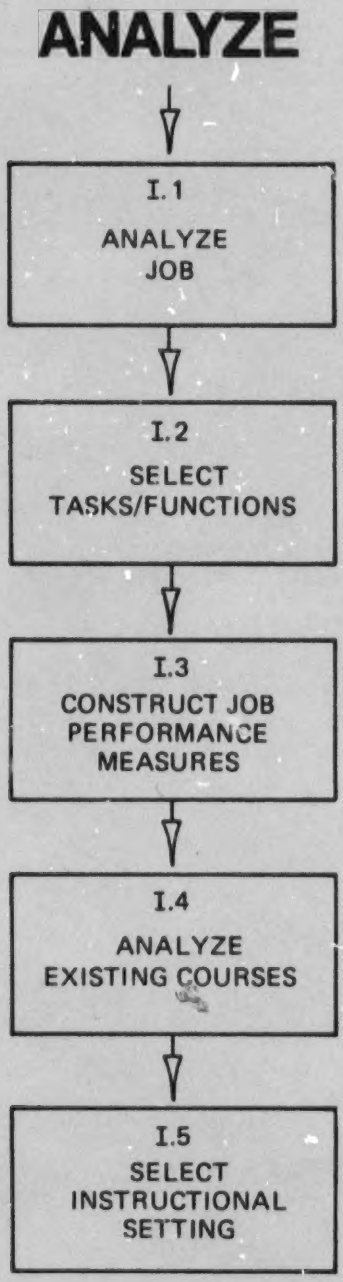
The materials are usable in group mode workshops of two or three weeks duration for individuals who need to learn all of the ISD skills. The managers workshop is of approximately one week's duration and contains the major concepts, information sources, and strategies for selecting alternative forms of instruction.

The Senior Managers Workshop lasts approximately two days and deals with the longer range management, planning, budgeting, and strategy considerations necessary for the continuation of the new training system.

A design consideration permeating the IPISD Package is that all individuals within a command who are concerned with any of the aspects of instructional development should receive training at or near the same time in order to establish a common basis for communicating about methods, procedures, and evaluative techniques that are to be used.

It is anticipated that the IPISD Package will continue to be revised in the future both as an interservice training approach and within each of the services to meet the requirements of local situations. As experience is gained with the use of the IPISD Program it is anticipated that subsequent editions will continue to improve.

PHASE I:


ANALYZE
I.1
ANALYZE JOB
I.2
SELECT TASKS/FUNCTIONS
I.3
CONSTRUCT JOB PERFORMANCE MEASURES
I.4
ANALYZE EXISTING COURSES
I.5
SELECT INSTRUCTIONAL SETTING

BLOCK I.1: ANALYZE JOB

Introduction

Job analysis is a highly systematic procedure for finding out exactly what people do when they do their job, the order in which they do it, the conditions under which they must do it, and the level of skill or performance deemed adequate in the job. Job analyses are oridnarily conducted by observing a job incumbent do his job and making detailed notes on these observations, by interviewing job incumbents about what they do on their job, and by occupational survey methods.

Job analysis requirements are most often generated by the installation of new weapons or procedural systems, or to update knowledge about existing systems. The extent that one used the interview method, the observation method, or the occupational survey method depends on the nature of the job being analysed, the job data already available, and the availability of analysis resources.

Rationale

Job analyses have multipurpose uses in training, in manning requirements, and for personnel selection. Effective occupational survey techniques, combined with well constructed questionnaires, can yield an immense amount of valuable data regarding the task difficulty, rank and experience level of performers, and the supervisory requirements for jobs.

In ISD, the principal concern is with training. Specifically, one of the more important purposes of job analysis is to concentrate resources

on the high priority jobs and the tasks which make up those jobs, and to reduce resources which may presently be concentrated on tasks of lower priority. In order to know how to train individuals to do jobs, it is necessary to have highly detailed information about how the jobs are done. The training system is intended to be totally supportive of the job world and as such must be based on highly detailed information.

In ISD, job analysis effort probably represents the greatest investment of time and money of any of the initial steps of course design. This investment, when it is properly managed, yields extremely impressive payoffs in training effectiveness and cost efficiency. These payoffs are principally due to the organization of training and aimed at concentrating on the important aspects of the job and selectively ignoring the unimportant parts of the job.

Inputs

The inputs to the Analyze Job block ordinarily come from:

1. needs analyses conducted by higher headquarters,
2. the installation of new systems, weapons, equipment, or procedures, and
3. the systematic periodic updating of Defense Occupation Specialties (DOS).

Items 1 and 2 may indicate that a job is being analyzed for the first time in which case there will only be a very small information base for inputs. Item 3, on the other hand, represents a revision in the job required in some DOS and will have a significant literature which needs to be examined. In addition to the above inputs, after a

job has been analyzed, and training has been designed according to an ISD process, there will be internal systems inputs to the Analyze Job block provided in the form of feedback from Phase V.

Procedures

The basic procedures employed in job analyses include the following:

1. the initial development of a tentative task list. Such lists are ordinarily developed by studying existing written doctrine, by convening a jury of experts who can detail the requirements of a specific job, or, in the case of new jobs, by analyzing similar jobs and by engaging in a concerted work effort with the developers of new hardware and systems.

   Once a tentative task list has been generated, it is necessary to decide whether the observation method or interview method or a combination of both will be used to perform a job analyses. Or, in the case where it is possible to perform an adequate occupational survey, the decision may be made to go directly to those procedures.
2. The second principal step in analyzing jobs is to authenticate the task list by going to actual job incumbents, either in person or by questionnaire, and having them verify the performance of the tasks on the lists, and depending on the management decision, provide descriptive characteristics of those tasks.

3. Once a task list has been developed, it must be validated. Validation is a process through which a task list generated from one set of incumbents and supervisors is submitted to other such people for verification. This process insures that the tasks on the lists are those actually performed by members of the DOS. Generally, at the same time--with the same questionnaire survey--that the task list is being validated, data will be collected upon which to base the selection decisions to be made in the next block. Details of this additional data to be collected will be given in the next block.
4. A final part of the process, depending upon the management decisions, will be to collect the conditions under which the tasks are performed, cues that initiate and guide performance of the task, and the standards which represent adequate task performance. Further, if such information is not already available, it will be necessary to collect the description of the task elements, those subparts of the task necessary to its performance but which are not performed as an end in themselves.

Outputs

The outputs of Block I.1 will include, depending upon the methodology selected, a validated list of tasks, the conditions under which the tasks are performed, the initiating cues, the standards to which tasks must be performed, and documentation of the task elements.

In addition, a documentation report will be prepared which describes the methodology employed in performing the job analysis, the principal findings, and the principal difficulties encountered.

Management Decisions

The important management decisions in analyzing jobs will be in the following areas:

1. Approval of plan. The first action in the conduct of a job analysis is to develop a plan which describes the method of task list development, the procedures for validation of the task list, and the procedures for obtaining detailed information on how the tasks are performed.
2. Support of plan. Since a large number of job incumbents, their supervisors, and others are usually involved in job analysis, management support must be provided in a number of locations to assure that the involved individuals can make maximum contributions to the job analysis effort with minimum interference with their regular duties.
3. Monitoring of plan. Since no plan can make provisions for every possible occurance, revisions may have to be made and approved. Management must assure that any deviations from plan are justified and appropriate.

Because each of these decisions requires the commitment of resources, making the decisions will require discussions of alternatives and the trade-offs among what is desired, what is available, and what can be afforded. As the basis for all that follows, it is particularly essential that the job analysis output be accurate and complete.

BLOCK I.2: SELECT TASKS/FUNCTIONS

Introduction

The second step in the ISD procedure is the selection of tasks for which training will be given. Information collected during the job analysis and occupational survey procedures in the prior block is used to decide which tasks are of sufficient importance to train.

Selecting Tasks/Functions represents a critical step in the ISD process because it is at this point that those tasks selected will obligate resources throughout the entire ISD procedure. Any task rejected is, for the training establishment, no longer a factor.

Rationale

Fundamental to the notion of selecting tasks for training is the assumption that there rarely will be enough time or resources to train everything that might be desirable to train. While it may be possible under some highly threatening national circumstances to obtain financial resources, it is likely that even then the available time and personnel resources cannot be directed to the training effort. In any event it is assumed that because of these resource constraints, decisions will have to be made in terms of the priorities assigned to the various tasks.

Even if there were unlimited time and resources, some tasks would have to be trained before others because of the serial nature of work. One way of conceptualizing this part of the process is to list the tasks in the order that they will be trained.

The past few years have seen improvements in the techniques and procedures available for task selection. Exceptionally good data is now

available upon which to base decisions, and it is no longer necessary or desirable to rely on guesses about which tasks most need training in order for the job to be done adequately. Just as a job analysis describes what it is that individuals do when they do their job, in sufficient detail to allow for good decisions to be made about curriculum, selecting tasks/functions allows clear decisions to be made about the relative importance of the various tasks compared to the resources available.

Inputs

The output from Block I.1, Analyze Job, is the fundamental input to Block I.2. This output will come in the form of a documentation report which will include a task list, and possibly the conditions initiating cues, standards, and task elements. However, depending on management decisions, only the unvalidated task list is essential to beginning work in this block. This is because the validation procedure in Block I.1 generally is done together with the collection of data for making selection decisions in this block.

Processes

The first important process in selecting tasks is the identification of the criteria that will be used for selection. Task criteria which have been used in the past include the following:

1. The percentage performing. This refers to the percentage of people who completed the questionnaire or interview who said they actually performed the task.
2. Percent time spent performing. Of those who performed the task, this is the percent of their total work time they spend on the task.

3. Probable consequence of inadequate performance. Many tasks are of such a nature that if they are performed improperly or inadequately the consequences to mission success accomplishment, equipment, or personnel are extremely severe.
4. Task delay tolerance. Each task has an initiating cue. This refers to the time when it becomes appropriate or necessary to perform the task. Task delay tolerance refers to the amount of time that can be tolerated between the initiating cue and the actual performance.
5. Frequency of performance. This refers to the likelihood that a task will be performed frequently enough to require training.
6. Task learning difficulty. Learning difficulty refers to the amount of time required to learn the task to an acceptable level of performance.
7. Probability of deficient performance. This refers to the likelihood that job incumbents will fail to perform a task adequately.
8. Immediacy of performance. This refers to the time lapse between an individual's assignment to a job and the time when he is expected to perform the task.

There are many other criteria which have been used by different people. However, it is important that criteria be selected that reflect the needs of the using command. Then when data are collected on how each task is rated on these criteria, the best professional military judgment will have been obtained upon which to base selection of tasks for training.

The next part of the process is to organize tasks, based on the criteria determined earlier into those for which training is not required, those for which training must be provided, and those where training is optional depending on availability of training resources.

Finally, based on the available resources, selection criteria, and the composition of the task list, recommendations are made on which tasks should be trained and which tasks should be learned by individuals on their own.

Outputs

The primary output will be a list of tasks selected for training. There must be considerable interaction between training resource managers and task selection managers to prevent selection of more tasks for training than resources will permit. It is also possible to have a greater capability for training than task selection criteria would dictate. Either of these situations should call for a reallocation of resources to more important programs.

A second output is the complete documentation of the methods and procedures followed and the assumptions and considerations which govern the output. This part of the documentation will be extremely valuable the next time job analysis is performed in the DOS.

Management Decisions

The important management decisions required in selecting tasks/functions are:

1. Provision of inputs to, and approval of the task criteria to be used in selecting tasks for training.

2. Determination of resource allocations for development and implementation of training programs.
3. Approval of tasks selected for training. These are critical management decisions since they obligate resources to training the chosen tasks.

BLOCK I.3: CONSTRUCT PERFORMANCE MEASURES

Introduction

A third critical function in the ISD process is the construction of Job Performance Measures (JPMs) for each of the tasks selected for training. Job Performance Measures may be combined to make up the tests which tell whether or how well a person can perform a job.

Each task selected for training must have an associated JPM which is the best available indicator of performance. Job Performance Measures are used to determine job proficiency, design and evaluate training, and maintain quality control. They are used by unit commanders, the personnel system, and by the training system when there is a need to measure job performance or to design or evaluate training.

Rationale

Recent developments, arising out of the management of the military system, and decisions by the United States Supreme Court have made it mandatory that Job Performance Measures of the highest possible technical quality be developed for each job in the service. In addition to the obvious direct benefits to military training and operations, good JPMs can eliminate unnecessarily restrictive standards in many DOSs and, at the same time, eliminate charges of real or apparent discrimination in job assignments.

The development of JPMs is a highly technical professional area in which one finds many measurement specialists. From time to time it will be necessary to obtain inputs from these specialists in order to insure the quality and utility of the JPMs.

In job analysis, it is necessary to document the conditions under which tasks are performed and to obtain real or estimated standards which must be met in order to perform the tasks satisfactorily. Here, a determination is made to see how best to measure the documented requirements for any given task.

It is in this block that a clear statement is made about what is expected in job performance. Systems respond to those elements within them which are measured and used as the basis for evaluation. What is measured by the JPM will be that which is aspired to by the incumbents.

The development of JPMs is a difficult technical assignment primarily because of problems with:

1. Validity. Validity is the degree to which a JPM measures what it is intended to measure. Often, particularly with combat tasks, validity is difficult if not impossible to ascertain.
2. Fidelity. The administration of performance tests in many DOSs is extremely difficult. It is not always possible, at any reasonable price, to maintain high fidelity.
3. Administration. The administration of JPMs in some DOSs can present complex problems of logistics. In some instances there will be test problems involving the use of heavy, complicated, or delicate equipment which may or may not be continuously available. Many people may be needed.
4. Costs. Obtaining high validity and fidelity may be more expensive than the probable benefits.

5. Time. It may take more time to administer some tests than is practical under normal circumstances.

While it is absolutely essential that adequate resources be devoted to the development of JPMs, it also must be realized that there are limitations and constraints which necessarily reduce their total usefulness. The degree to which these constraints and restrictions can be overcome will determine in part the relative success of the JPMs through time.

Since JPMs operationally define the task in question, their development must maintain as high a degree of validity and fidelity as is practical. In this manual, an operational definition refers to the specific observable actions or symbols which, when they occur, are said to be evidence that the phenomenon exists. For example, if the task requires fixing a component and the JPM requires describing how it works, this change defines the task in terms of what is measured, not necessarily in terms of what is desired. Virtually any reduction in the quality of a JPM will mean the overall performance status of the entire service is reduced by that amount.

Inputs

The inputs to this block will be a list of tasks that have been selected for training, along with the conditions, cues, standards, and elements.

Processes

There are a variety of processes which must be performed in order to insure that the output of Block I.3 is adequate. The output must be

adequate not only in terms of the JPMs that are produced but also in terms of the considerations and recommendations for simulators.

Many systems, particularly those procured outside the service from contractors and suppliers, will have a simulator analysis prior to the time the development contract is awarded. On the other hand, the need for simulators not contracted as a part of the hardware system must be determined through careful analysis of existing operations. The method used to determine a need for simulators, would be that of comparing the possible performance on the available JPMs with that level of performance required on the actual job. If realistic field conditions can be created and adequate feedback given without the use of simulators, then they may not be necessary. If the job calls for a level of practice and precision far beyond that which it is now possible to provide, it may be necessary to develop a simulation device.

A second requirement in the development of JPMs is to determine the level of fidelity that is going to be built into the JPM. A high fidelity JPM is one which closely resembles the actions, conditions, cues, and standards actually performed on the job.

Another process in JPM development is the analysis of time and cost required to administer the JPM to members of the DOS. Excessively high costs and long periods of time for test administration must be avoided.

The JPM developer must decide whether he is going to use a product, process, or a combination method of evaluation. The selection is governed by the characteristics of the task and cost and time considerations.

The JPM must be as objective as possible and yield hard performance data which can readily be interpreted.

Once these decisions and determinations have been made, it is possible to begin preparation of the JPMs. Each JPM is associated with one task. It measures enough parts of the task to make a sound generalization about task performance. In some instances, the whole task must be measured to make a judgment while in other instances parts of the task will reveal whether or not the incumbent can perform.

The final step in development of JPMs is the validation of the JPMs under field conditions. To be validated, the JPMs must be administered to job incumbents and the JPMs must separate them into categories: those who can perform the task, and those who cannot. If the JPM does not yield an adequate measure of the task to permit accurate decisions about those individuals who can perform and those who cannot, it must be revised until it meets those requirements.

Outputs

The outputs of this block include a validated Job Performance Measure for each task selected for training. This JPM then becomes the official performance measure for that task, and its inclusion in various kinds of tests indicate that it is the approved measure of performance for that task in the service.

A second output is the scoring key, directions, and procedures package which accompanies the JPM and provides the exact steps, procedures, and resources necessary to administer the test appropriately.

Management Decisions

Management decision-making requirements in Block I.3 are quite heavy, not only in terms of the number of alternatives that must be explored

and chosen, but also in terms of the impact these decisions have on future training and personnel decisions.

The first decision that will need to be made by the manager is which of the JPMs shall be developed first. Since there will be a rather lengthy list of tasks for which JPMs will be required, these JPMs must be ordered and some done before others in order to accomplish the work in a reasonable period of time. In the process of analyzing the tasks for performance, it will become apparent that some tasks will be relatively straightforward and easy to measure while others will be rather complicated and require more time. Some JPMs may require special kinds of simulators and training devices which will require a long lead time for their acquisition.

A second kind of decision will involve a large variety of resource and technical trade-offs. The technical characteristics of the JPM may require that it be administered under field conditions in as realistic an environment as possible. On the other hand, the time and resource constraints may limit the number of people who could be tested under those conditions. It will be the manager's responsibility to examine the total number of JPMs required, the total time and resource requirements, and to make reasonable trade-offs among these requirements and constraints.

A third kind of analysis and decision will involve those JPMs in which the testing errors from the past have been known to misclassify those who took the test. That is, the test has either indicated people were competent or qualified who were not, or, it has indicated that qualified people were not qualified. Either kind of error is extremely

difficult to tolerate, but the manager must choose among the alternatives, decide which risks he is willing to assume and which he is not, and allocate his resources accordingly.

The last set of management decisions involves the validation process. Test validation, like markmanship, can always get better. That is, a test can be revised and improved until its validity reaches the technical limit. The manager must decide the level of validity that he will be willing to accept and the amount of his resources that he is willing to invest in achieving that level of validity. In those DOSs with minimum risks, one can be satisfied with lesser validity than in those where inadequate performance can have disastrous results.

While this list does not exhaust the management decisions required in the development of JPMs, it does highlight the significant decisions that he will be forced to make and indicate the areas in which he may require inputs from professional individuals.

BLOCK I.4: ANALYZE EXISTING COURSES

Introduction

A basic objective of the Interservice Procedures for Instructional Systems Development is to facilitate and encourage interservice training in all those situations which meet the established criteria. By careful analysis of the courses existing within and among the services according to a recommended set of procedures, it is expected that the benefits of interservice training are more likely to be realized. These procedures provide guidelines for making the analysis and suggest criteria which can be applied in order to estimate the potential usefulness of existing training.

Rationale

These procedures are included at this point in the model to avoid unnecessary duplication of effort wherever possible. To make this analysis in the absence of reliable job analysis data could well be misleading. Many courses of the same name do not have the same content, nor do they emphasize the same tasks or conditions. The primary purpose, then, of this block is to determine the degree to which an existing course teaches the same tasks that the command needs to teach.

A second important reason for these procedures is to enable any service to take advantage of prior work done within that service or within the other services. The position taken here is that duplication of instruction is not, in and of itself, evidence of bad planning. In many cases, the location and existence of a course which is operating at capacity may well preclude sending additional people

to it. Certain obvious examples, such as basic training, provide the basis for these conclusions.

Probably the most important reason for the inclusion of this specific step is to allow for the orderly communication about and the common acceptance of courses which are selected for joint development. If a course to be jointly developed by two or more services is developed according to the same procedures and techniques, it is far more likely to meet the requirements of all the participants. It is to that end, that these procedures have been designed.

Inputs

The inputs to Block I.4 include any existing job analyses, tasks selected for training, or job performance measures which have been developed. These existing materials can come from two separate sources:

1. from existing courses currently in operation in one or more of the services, and
2. from new developments where job analyses, task selection, or job performance measures have been produced.

It is more likely that the analysis of existing courses would take place within a service although many opportunities for sharing training do exist. It is more likely that new front-end work will have been the product of joint development efforts.

Procedures

There are two separate kinds of procedures involved. The first involves locating the existing courses and obtaining sufficient information to make a careful analysis. The second involves the analysis itself.

Locating existing courses is ordinarily done best through a search of the published documents available from the various services. These documents are referenced in the manuals. The primary effort is to locate the organization which has proponency for the course in question in each service and to communicate with them according to established procedures. Inquiries of this nature must become routine in order to avoid potential conflicts over perceived vested interests. What is particularly needed at this point is not the actual instructional materials, but the documentation of the implementation and outputs of job analysis, selection of tasks for training, and development of job performance measures.

Having obtained this information, the next procedures involve the analysis of the first three steps in ISD, the job analysis, task selection, and performance measure functions. If the job analysis has been accomplished by an acceptable procedure, and the survey sources were similar to those for which the current training need exists, the task analysis is acceptable as a reliable basis for training. The criteria for selection of tasks for training must be carefully reviewed. It has been found that confusion often exists on such questions as "operation of equipment" as opposed to "maintenance and repair of equipment." Tasks involved in such functions must be carefully examined to be sure that the criteria used for selection of tasks for training are acceptable for the current purpose.

The third important point of analysis is the job performance measures in the existing course. The ideal is to find a perfect match between the tasks selected for training and the measures of those tasks. If the job analysis has been done correctly, the tasks selected for

training appear to meet the needs of the current course planning effort, and the job performance measures appear to have been carefully constructed and validated, the opportunity for using the existing course increases greatly.

The final major part of the analysis is to determine if the existing course has been properly validated; that is, has it been determined that students who take the course can, as a result of taking the course, pass the job performance measures. If the course has not been validated, this must be done before the course can be accepted as suitable for the training needs.

Outputs

The output for Analyze Existing Courses includes a rationale for the analysis and the procedures that were followed in making the analysis. It should be complete enough to indicate that an adequate search was made and that the analysis met the current needs. A second output includes a summary listing of the courses analyzed and those sources examined to discover the courses. The third element of the output includes the major decisions made following the analysis including the rationale and explanation of the decisions. Ordinarily, this decision will not be a simple yes or no, but will be somewhat more fragmented. It is more likely that only parts of existing instruction may be used as part of the new instruction.

Management Decisions

Of all the management decisions required in Phase I, the decision to use all or part of an existing course can be one of the more important. Opportunities for savings in resources and time are clearly

apparent if suitable courses already exist. On the other hand, using instruction simply because it exists may not be a good decision for a manager to make.

The manager should be careful to avoid the normal kinds of error in these decisions, namely, to accept courses which do not meet the needs or to reject courses which do meet the needs, because they were not developed locally.

These decisions must be based on much more than the existence or non-existence of acceptable instruction. They must take into account the future needs of the service, the ability of existing instruction to accept new enrollees, whether or not existing instruction can be exported to other locations for delivery, and whether the opportunities for true cost savings, increased effectiveness, or decreases in time are predictable.

Fortunately, such categorical decisions as "accept" or "reject" rarely are required. More often, it is the function of the manager to decide which segments or subsets of existing instruction can be used and which can not.

Acquiring expertise in the cooperative course development effort within the services presents the opportunity to obtain one of the greater benefits in the entire ISD process. It should also be realized that cooperative development efforts have the firm support of the major commands, the congress, and central military agencies. Using these procedures competently can improve the opportunity for recommending interservice training "from the bottom up" rather than having it imposed "from the top down."

BLOCK I.5: SELECT INSTRUCTIONAL SETTINGS

Introduction

To insure that adequate training resources will be available when required upon the completion of the development of training, an early decision must be made assigning the tasks to the instructional setting or settings in which they will be trained. The optimal instructional setting for tasks is one that provides the most effective and efficient training to those members of the DOS who require the training. Setting decisions are very important in arranging training so that the trainee will be trained at the point in his career or assignment when he needs the knowledge or skills.

There are five instructional settings in the ISD procedures to which tasks can be assigned:

1. Job Performance Aids (JPAs) (even though a job performance aid is not technically instruction, it can serve to eliminate the need for instruction)
2. Self-Teaching Exportable Packages (STEPs)
3. Formal On-The-Job Training (FOJT)
4. Installation Support Schools (ISS)
5. Resident Schools (RS)

Guidelines have been established for the assignment of tasks to instructional settings and these guidelines are determined in part by the capability and resources of the various settings as well as the need for training at any point in time. The guidelines can be applied to the various clusters of similar tasks which can be nominated

for specific settings. After all of the tasks have been accounted for, the total list of tasks, with the training setting nominations are then discussed with appropriate management personnel. Trade-offs are made based on the requirements and resources of the command in order to arrive at the most effective, time-efficient, and economical assignments.

Rationale

Setting decisions have a direct impact on the total training system. This is particularly true when tasks have been assigned originally to one setting and then, on the basis of sound application of ISD guidelines, are assigned to another setting. As a consequence, personnel often must be reassigned to the new setting to provide the instruction.

If setting selection guidelines are not followed, newer training approaches are difficult to introduce. Further, some settings are less costly and there is good reason to believe that some settings will definitely prove to be more cost-effective as sufficient data becomes available to make these evaluations.

If all instruction is developed according to ISD principles, it will no longer be possible to claim that some settings must always be second-best. As settings become equally effective, the decision about selection will become easier to make.

Inputs

The inputs to Select Training Settings are:

All of the documentation from Blocks I.1, I.2, I.3, and I.4.

Procedures

The procedures to be followed for assigning tasks to instructional settings involve the application of guidelines for determining the suitability of each setting for the particular tasks in question. After the tasks have been clustered according to the skill level of personnel who will be involved, they are then clustered according to the constraints such as resources, equipment, and facilities which are required to train the tasks. After the initial clustering, the tasks are examined first to see whether they are suitable for treatment by a job performance aid. Job performance aids range from simple lists of instructions or decals applied directly to equipment to very complex, fully proceduralized aids for maintenance and repair tasks which contain minute step-by-step procedures for task performance.

Tasks can be assigned directly to a job performance aid when task performance can be totally accomplished using the JPA. Often, JPAs are suitable for a task, but some training must be given on the use of the job performance aids.

If job performance aids are not satisfactory, the second setting considered is the self-teaching exportable package (STEP). STEPs can be any form of exportable instruction which does not require the presence of an instructor at the training setting. However, feedback must be provided either in the form of correct answers or school solutions or in the form of responses from correspondence course instructors. STEPs can be in print form, in audiovisual form, or in the form of a kit which can be assembled or manipulated.

A third training setting which is given careful consideration is formal on-the-job training (FOJT). If resources on the job permit

the assignment of tasks to FOJT, and a management system is in place which can handle the administration and testing involved in FOJT, tasks can be considered for assignment to this setting. FOJT has the advantage of providing continuous training on tasks which are of immediate need to the trainee. Further, FOJT can continue for whatever length of time is necessary for the trainee to achieve mastery of the test. FOJT is limited to those situations where it is administratively possible to conduct the training, and where the facilities are adequate.

If a task is not assigned to any of the above settings, it might meet the criteria for assignment to an Installation Support School (ISS). Installation support schools are operated by local commands, principally to meet local needs either in those DOSs where shortage of personnel exists, where new equipment or procedures are required in the field, or where there is only a temporary need for the training.

Finally, if none of the other settings prove to be satisfactory, the task can be considered for resident school instruction. Since resident school instruction is ordinarily believed to be the most expensive of the settings, it should be used only when the other forms of training will not suffice. There are certainly many excellent reasons why one would choose to use resident school instruction rather than other settings. But, resident schools do have limitations, particularly in being able to train tasks for which the individual has an immediate need. Further, often individuals who are graduates of resident schools are not assigned to perform the tasks immediately upon reaching their duty station and the trainees lose proficiency on specific tasks while they are performing other duties. Because the resident school cannot often be exactly like the real world, some training does not transfer well to the job.

Then, after all of the nominations are completed, the persons responsible for the setting being considered meet to discuss the necessary trade-offs required to achieve the desired training results. Appropriate management personnel familiar with the alternative costs of training settings participate in these discussions so that resources, costs, and requirements can all be given adequate consideration.

Outputs

The outputs of the Select Instructional Settings block include the following:

1. The list of tasks selected for training along with their assignment to an appropriate training setting.
2. Documentation and explanation for the rationale of the choices.

Management Decisions

Since the management decisions in Phase I have profound effects throughout the remainder of the instructional design and development effort, every effort should be made to ensure that the best possible data are furnished to the decision maker.

Decisions involved in this block will include resources, costs, and the coordination of departments within the command and also with many persons external to the command.

Training setting decisions will, through time, become more and more dependent on adequate and accurate cost information. Two specific

approaches should be studied now, and future developments in training setting costs should be carefully followed. The Navy has developed a cost model, A Technique for Choosing Cost-Effective Instructional Delivery Systems (TECEP), which is a straightforward procedure for beginning the systematic collection of cost data. A second and more specific approach, is contained in a study by the Rand Corporation.

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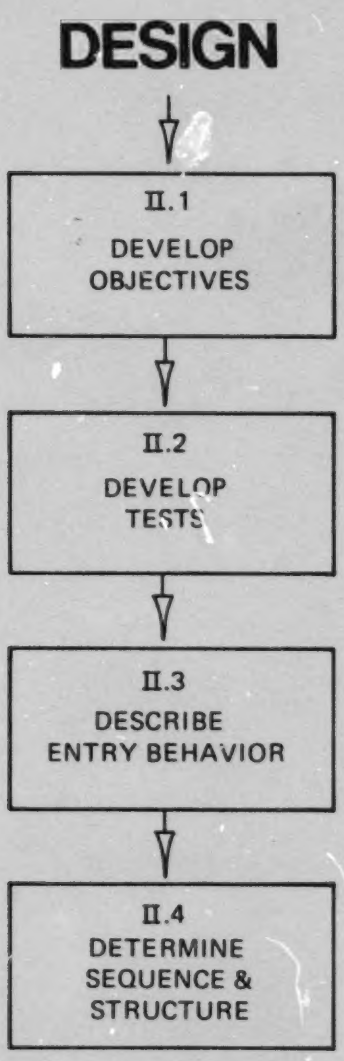
PHASE II:


DESIGN
II.1
DEVELOP OBJECTIVES
II.2
DEVELOP TESTS
II.3
DESCRIBE ENTRY BEHAVIOR
II.4
DETERMINE SEQUENCE & STRUCTURE

BLOCK II.1: DEVELOP OBJECTIVES

Introduction

In this block, using the outputs from Phase I, the learning tasks are analyzed. It is in this block that the break occurs between the job world and the training world. It has long been recognized that there is a distinct difference between the performance of a task under job conditions and learning how to perform that task in an instructional setting.

The job performance measures (JPMs) developed in Block I.3 provide the basis for developing learning objectives. The learning objectives developed in this block are the common three part objectives that have been used for a long time involving a statement of the action, conditions, and standards involved in the performance. In the ISD model, learning objectives are written for four distinct types of learning: information, mental skills, physical skills, and attitudes. This is because it has been determined that the conditions for learning in each of these categories is different. Proper classification of learning into the categories allows for the design of instruction to meet specific learning conditions.

The terminal learning objectives are analyzed in sufficient detail so that all of the knowledges and skills necessary to learn the objective are specified. When all of the learning objectives have been prepared, they are ready to have test items written. This is done in the next block.

Rationale

Learning objectives have been found to be an extremely good means for controlling the intent of instruction. They communicate adequately to the student, the instructor and the instructional designer exactly what it is the student is expected to do in order to demonstrate his mastery of the objective.

Learning objectives serve as a control over the content of instruction since they must be based directly on the job performance measures. Because thereeis a direct relationship between each learning objective and a job performance measure or part of a job performance measure, much unnecessary instruction can be eliminated.

For many types of students, simply providing the learning objectives and the necessary learning resources is all that is required to obtain acceptable performance. Further, since learning objectives are stated in terms of what the student is expected to do rather than what the instructor or supervisor is expected to do, a much better control over the output of instruction can be obtained.

Inputs

The inputs to Block II.1, DEVELOP OBJECTIVES, consist of the total output from Phase I. Each specific Phase I block's output can help to clarify or further specify the necessary instruction which the designer can use to develop learning objectives.

Procedures

The first step in developing learning objectives is to prepare terminal learning objectives which are the direct translations of the job performance measures into learning objectives for the training world.

These terminal learning objectives will describe the actions, conditions and standards which will be met in the training world in order to prepare the person for the job. A terminal learning objective is a specific description of the action the learner is to exhibit after training, the conditions under which the action will take place and the standards or criterion which must be reached for satisfactory performance.

Terminal learning objectives require action statements which have been developed using verbs which call for observable behaviors on the part of the student. The action is a statement of student behavior, describes the creation of a product, or some other act which can be accepted as evidence that the intended outcome has occured. In order to be acceptable, this behavior must be observable and subject to evaluation. The conditions portion of the learning objective includes specific statements about what the student is given (books, training manuals, etc.). The standards portion of the learning objectives includes the criteria for acceptable performance. These criteria are statements about completeness, accuracy, available time, etc.

Information type learning objectives require the student to recall bodies of knowledge. That is, the student may be asked to recall information necessary to complete a form. Mental skills type learning objectives require the individual to identify, classify, use rules, or solve problems which involve thinking, creating, and analyzing. Physical skills type learning objectives involve some physical or manipulative activities. They require movement of some of the muscles of the body and are directly observable. Attitude type learning

objectives usually are not directly observable but are ordinarily reflected in the choices that an individual makes. For example, if an individual had a choice between two different methods of performing a task, one safe and one unsafe, and he chose the safe alternative, he could be said to have a positive attitude toward working safely.

In the area of mental skills, it is often the case that an individual cannot learn to do one skill if he has not mastered certain prerequisite skills. Mental skills learning objectives must be analyzed for the required prerequisite behavior until a level of skills is reached at which it is assumed that all trainees have already reached mastery.

For example (see Figure 2), if a terminal learning objective is for an individual to navigate from point A to point B, it would be necessary to analyze the prerequisite skills. In this case it would be necessary for the individual to interpret symbols on a map and to use a compass. Further, in order to interpret the map, he must be able to use the legend and to use the grid system. In order to use the legend he must be able to match symbols to actual terrain and match the symbols to the legend. Prior to matching the symbols, he must be able to identify the symbols.

This process of analysis details every step to be sure that nothing has been overlooked so that individuals are not given instruction for which they are not prepared, and at the same time, are not given instruction which they have already mastered. (see Figure 2)

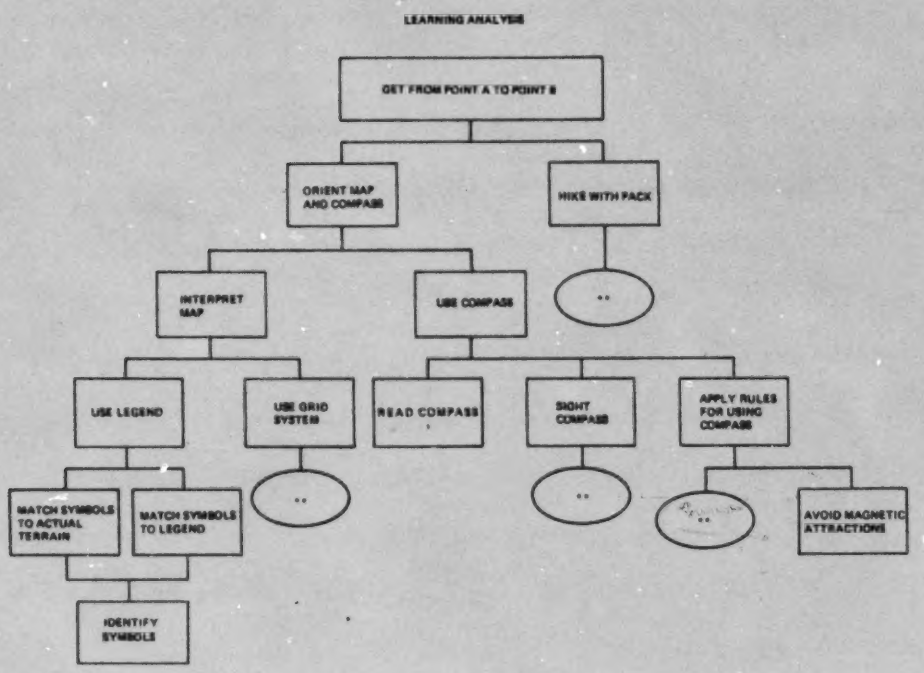


FIGURE 2: Learning Analysis

Outputs

The outputs from Block II.1 include a list of terminal learning objectives, learning objectives, and learning steps analyzed to the level where it is assumed that individuals beginning instruction will have the necessary prerequisites. These objectives will be used for the development of tests in Block II.2 and for the sequencing of objectives in Block II.4. In Block II.3, assumptions about the level of prerequisite knowledge and skill in the target population will be verified.

Management Decisions

Management decisions in Block II.1 will involve principally the inspection of the learning analyses and the learning objectives developed. The learning objectives should be properly stated, analyzed, and organized. The manager must look for those objectives which do not conform. There are many potential errors in the development of objectives including:

1. The student's mental process rather than observable behavior.
2. The standard is absent or deficient.
3. The statement of conditions is missing or poorly specified.
4. The objective is stated in instructor rather than learner terms.
5. The behavior stated is too broad. It does not adequately describe the specific outcomes.

In reviewing the learning objectives, the manager must identify the relationship between the terminal learning objective as stated and the job performance measure upon which it is based. Learning objectives should be examined to insure that each subordinate step is directly related to the terminal performance. Often, learning objectives are written in such a way as to preserve existing instruction rather than to conform to the requirements of the job performance measure. It is the manager's job to insure that these relationships are direct and clear.

BLOCK II.2: DEVELOP TESTS

Introduction

In Block II.1, the job performance measures were analyzed and learning objectives were written which described what had to be learned in order for the task to be performed. Often what has to be learned takes more time and has more intermediate steps than task performance itself.

In this block, tests are written which measured the outcomes of instruction at whatever level of detail the instruction is offered.

Test items are written for each kind of learning objective, making sure that all significant features of what has to be learned are represented in the test. These test items may be used on entry tests, pretests, unit posttest, or end of course tests.

Enough test items are written on all of the learning objectives to allow for initial testing of the learning objectives and enough alternative forms of the test to permit retesting those situations where this is necessary. Once the test items have been developed, they are ready for use in the next step, DESCRIBE ENTRY BEHAVIOR, in which assumptions about the student population are verified and modified.

Rationale

The key to any successful instructional program is the precision with which what is taught is tested. The quality of the tests developed here will have an important impact on the quality of the instruction. The tests must have good technical characteristics (and good reliability and validity) since they will form the basis of many decisions that will be made about students and about the quality of the instruction.

Inputs

The inputs to the Develop Tests block include:

1. job performance measures developed in Block I.3,
2. the setting selection information from Block I.5, and
3. all learning objectives developed in Block II.1.

Procedures

The procedures used in this block resemble those used in Block I.3, CONSTRUCT JOB PERFORMANCE MEASURES. The principal differences in the procedures used include:

1. Tests required to measure learning objectives and learning steps are prepared in much greater detail than those required to test job performance. Tests prepared to measure the effects of instruction must be written so they can also be used for diagnostic purposes.
2. Many items are written on knowledge and skill subordinate to the terminal learning objective. These items are not important in and of themselves but only as they allow the testing of the subordinate skills.
3. Tests for different learning objectives usually appear as different items. That is, tests for mental skills generally require the application of the skill while tests of information ordinarily require the individual simply to recall the information.

Performance standards are usually less demanding early in training than they are later in training. In many cases, test items need to be written which reflect the level of skill necessary at an early point

of training and a different test item used at a later stage in training in order to more closely approximate real world job performance.

If existing courses are available, the test items developed in this block should be administered to present or recent graduates of the existing course in order to try out the test item and also to define the baseline content coverage of the existing instruction.

Finally, the test items are revised based on the initial tryout to eliminate any inconsistencies, confusing points, or difficulties in performance.

Outputs

The outputs for Block II.2 include:

1. items for entry tests,
2. items for pretests,
3. items for within course test, and
4. items for posttests.

Management Decisions

Many of the problems encountered in developing tests have solutions of a technical nature which often require little management intervention. The questions such as improving the reliability or validity of the tests often have relatively straightforward methodology.

The manager will need to be concerned with the degree of fidelity available in the testing situation, the completeness and thoroughness of the tests, and the use of these tests in establishing the baselines.

The manager will also be concerned with the establishment of criteria or cut-off scores which are used in many situations to separate people into two groups: go or no-go. Since many of the criteria

currently used are arbitrary, the manager must be concerned with establishing attainable arbitrary cut-off scores which have some relationship to the job world. Since instruction is not offered for its own sake, but as a means to an end, the manager must be concerned with the kinds of test items used to be sure that they are consistent with the overall aims of the instructional program.

BLOCK II.3: DESCRIBE ENTRY BEHAVIOR

Introduction

Adequate design of ISD training requires a careful analysis and description of the entry behavior of the trainee. Entry behavior falls in two principal classes:

1. Basic aptitude and ability, and
2. Acquired knowledge and skills.

In the short term, very little can be done to change the basic aptitudes and ability of the entering trainee. However, longer term results can suggest the need for different selection criteria.

Assumptions must be made in Block II.1 about the level of knowledges and skills of the trainee. In this block, these assumptions are verified or adjusted depending on the result of testing of entry skills.

In addition to the entry test which is used to adjust the beginning point of a course, pretests for the instructional unit are developed to see to what extent students have already mastered the skills to be taught in the course. Provisions can be made for students to bypass certain blocks of instruction if they have already met the skills.

Rationale

A fundamental concept in ISD is that a maximum proportion of qualified trainees should meet the training requirements with the instruction provided. Since many trainees will begin the instruction with different knowledge, skill and ability, it is necessary to document this information so that course design can be tailored to the users.

Further, in those cases where it is desirable, more capable trainees can be allowed to advance through the instruction faster and thereby reduce the average training time. Occasionally it is necessary to design preliminary instruction to be offered to groups of trainees who have not achieved the necessary knowledge and skills to benefit from the instruction.

Inputs

The inputs to the Describe Entry Behavior block are:

1. The terminal learning objectives, learning objectives, and learning steps developed in Block II.1.
2. The test items for each of the learning objectives developed in Block II.2.
3. Administrative criteria from the personnel system.

Procedures

The first step is to develop an entry test based on the test items developed in Block II.2. These test items were prepared as a result of a learning analysis. The learning analysis was continued until a level was reached at which it was assumed that all entering trainees would have mastered these subordinate skills.

The test based on these items is administered to a sample of students typical of the population for which the course was intended. The tests are scored and used to verify or revise the assumptions made about the entry knowledge and skills of the trainees. Generally, all items passed by most of the trainees would not be included in the instruction, and all items not passed by a substantial portion of the trainees would be included.

This test will often detect certain areas that perhaps as many as 25 percent of the trainees have not mastered but which might lend themselves to preliminary training. If those prerequisite skills can be provided by brief preliminary training, the instruction can be designed to serve the level of the majority of the trainees.

The results of this administration of the test can be used to provide for further analysis in Block II.1, to revise the test items, or to verify that the assumptions made in Block II.1 were correct. Hopefully this process of testing and revision can be continued until the instruction is serving the largest proportion of the entering trainees.

For instruction in which it is possible for the trainees to bypass certain instruction on the basis of their performance on pretests of units of that instruction, the pretest can be developed in this block. If the course is self-paced, the student will be able to test as far into the course as he is able and begin instruction on exactly that module or unit that matches his current knowledge and skill. In block scheduled courses, it is often possible to place students in more advanced classes if they can pass the pretest over the blocks of instruction.

Outputs

The outputs of Block II.3 are:

1. The entry test which has been developed to verify the assumptions made in the learning analysis.
2. Pretests for those units of instruction that students may bypass.

3. The revised learning objectives and tests which match the entry behavior of the students as verified in this block.

Management Decisions

Management decisions in this block center around the question of the exact level of instruction at which the course will begin, whether or not remedial or preliminary instruction will be given to some of the trainees, and what the required entry abilities and aptitudes of trainees should be. The manager's job in this instance is to use the entry test and pretest data to match as precisely as possible the instruction with the entry behavior of the trainees. This is to avoid training individuals on materials they have already mastered and to avoid offering instruction to unprepared individuals when they can not possibly profit from that instruction.

The cost implications of correct decisions in this block are far-reaching. All instruction which can be eliminated through entry testing does not have to be developed. Further, any preliminary or remedial instruction which has to be offered should be justified on the basis that it serves an appropriate proportion of trainees and enables the course as a whole to function more efficiently.

BLOCK II.4: DETERMINE SEQUENCE AND STRUCTURE

Introduction

The specific purpose of this block is to identify those terminal learning objectives (TLOs), learning objectives (LOs), and learning steps (LSs) which are independent of each other, those which are dependent, and those which may have supportive relationships. When two learning objectives (the term "learning objectives" is used here to refer to TLOs, LOs, and LSs.) are independent, the learning of one has no effect on the learning of another. When two learning objectives are dependent, it is necessary to learn one prior to learning the other. In that case, the learning of the latter learning objective was dependent upon learning which occurred in the first learning objective. The third possibility exists when the learning of one learning objective supports or facilitates the learning of another, but the order in which they are learned is not important. That is, the learning in one will transfer to the other no matter which one is learned first.

Organizing the learning objectives into these three categories will assist the developers of instruction in two ways:

1. It will identify those learning objectives that must be presented before other learning objectives.
2. It will provide maximum flexibility where the relationships are supportive or independent.

Rationale

One of the more important discoveries in the last few years in the area of learning research has been the notion of a learning hierarchy.

A hierarchy refers to a learning situation in which it can be clearly demonstrated that the learning of an objective cannot occur until some prior learning has taken place. For example, learning to multiply three-digit numbers by three-digit numbers cannot be expected to occur until a person has mastered addition. Further, learning to divide multi-digit numbers by other multi-digit numbers cannot be expected to occur until the individual has mastered multiplication and subtraction. Many learning relationships exist in which it is necessary to analyze the objectives until the most fundamental learning steps have been specified.

Learning objectives are independent of each other when the learning of one of them has no measurable effect on the learning of the other. For example, the learning of maintenance techniques on 50 calibre machine guns would have little if any impact on learning how to typewrite. In these independent relationships, it does not matter at all in what sequence one masters the learning objectives.

In the third situation, one learning objective facilitates the learning of a second because the two learning objectives have psychologically common properties. In this situation, the learning of one learning objective would make the learning of the second easier, but it would not matter which of the two the individual learned first. For example, operators of motor vehicles are ordinarily taught to operate simple light-weight equipment before they are allowed to progress to complex heavier equipment. In this case, for learning to occur, it is not necessary to learn to operate the light-weight equipment first, it simply facilitates learning to operate the heavy equipment, and is less costly.

It is necessary to demonstrate the facilitative effects of prior learning on subsequent learning in order to be sure that the facilitative arrangement worked. In many cases, certain materials are taught before other materials solely as an administrative convenience or for historical reasons when there is no demonstrable reason based on learning efficiency.

In this block, when dependence is determined the learning objectives are sequenced. When support is determined, the learning objectives are kept together but not sequenced. Independent objectives will be sequenced by the instructional developers.

Inputs

The inputs to Block II.4 include the terminal learning objectives, the learning objectives, and the learning steps as analyzed and written from Block II.1. Further, the tests from Block II.2 which go with the learning objectives are included. The output from Block II.3, ANALYZE ENTRY BEHAVIOR, is also available for examination and use.

Procedures

The procedures for determining whether objectives are independent, dependent, or supportive include essentially the same process of analysis outlined in Block II.1. The function of the block is to serve mainly as a check and organizer of materials generated in the prior three blocks. It also provides for an independent look at the materials to be sure that the learning objectives are properly classified as dependent, independent, or supportive.

Outputs

The output of Block II.4 includes objectives which have been put into three categories, independent, dependent, or supportive, and

sequenced where applicable. In addition, the learning objectives are structured into related groups to facilitate further handling.

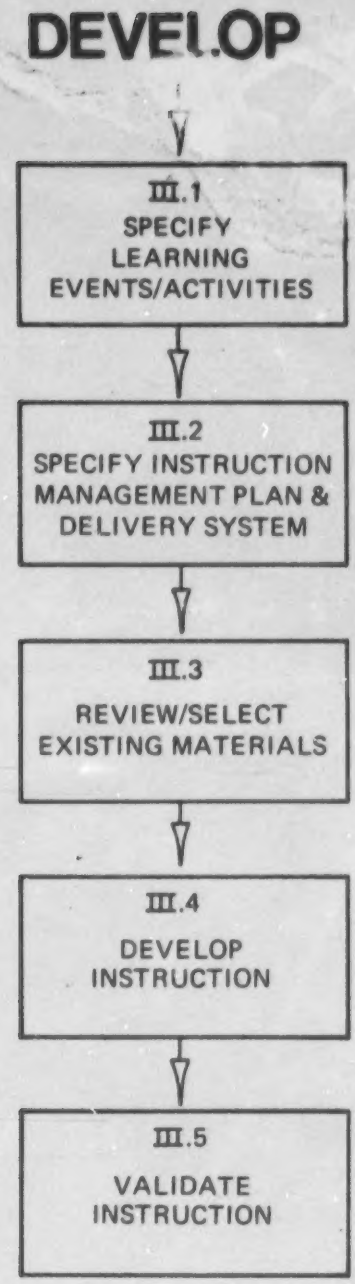
Management Decisions

It is not intended that the output of this block unnecessarily restrict the instructional designers or the instructors who will present the material. It is, therefore, the principal duty of the manager to insure that the dependent relationships specified as output are, in fact, dependent. The error that could occur here is to claim that two relationships are dependent when they are merely supportive. While it may not be serious, claiming dependence will clearly indicate order of instruction and that could be unnecessarily expensive.

A second error that could occur is claiming that two relationships are independent, when in fact they are dependent. In those situations, instruction could be designed out of order so that individuals have great trouble in learning what is expected.

The only logical errors that can be made in classifying supportive relationships are simply failing to identify those relationships which could be supportive. Losing this proper identification could make instruction less efficient than it would have been had the classification been proper.

PHASE III:


DEVELOP
III.1
SPECIFY
LEARNING
EVENTS/ACTIVITIES
III.2
SPECIFY INSTRUCTION
MANAGEMENT PLAN &
DELIVERY SYSTEM
III.3
REVIEW/SELECT
EXISTING MATERIALS
III.4
DEVELOP
INSTRUCTION
III.5
VALIDATE
INSTRUCTION

BLOCK III.1: SPECIFY LEARNING EVENTS/ACTIVITIES

Introduction

Specific learning events/activities must occur in the instructional environment in order to produce the desired learning outcomes. In order to identify the learning events and activities which must occur, two kinds of learning guidelines are used: those which are applicable to a wide variety of learning objectives and those which are unique to each category of learning. The objective of this block is to classify the learning objectives into appropriate categories and to identify the learning guidelines necessary for optimum learning to take place.

Further, activities are identified that must take place in the instructional environment in order to provide training most directly related to task performance. Learning guidelines provide the basis for the instructional developer to produce materials which will lead to appropriate learning events, and subsequently to appropriate activities on the part of the learner.

These learning events and activities are specifically taken into account in the following block when the media selection and instructional management plan are developed.

Rationale

The learning events and activities are dependent upon learning guidelines which have been developed by the Training Analysis and Evaluation Group. The guidelines are based on research in the psychology of learning which has taken place during the last 50 years. Much military research has been applied directly to the guidelines and

they represent at this time probably the most complete application of existing knowledge in that area of learning technology.

It has been known for a number of years that the learning of certain kinds of objectives occurs in fundamentally different ways than does the learning of other kinds of objectives. Sometimes, regular practice is required in order to maintain a skill while at other times practice in performance is not so critical. Further, it has been found that providing the opportunity for practice is often more effective than additional reviews of the material. The learning guidelines therefore specify the most appropriate approach for initial learning and maintenance of skills.

Inputs

The inputs to the Specify Learning Events/Activities block include:

1. The learning objectives developed in Block II.1.
2. The tests developed in Block II.2.
3. The entry behavior specifications from Block II.3.
4. The sequence and structure of objectives from Block II.4.
5. All the outputs from Phase I. (available for reference)

Procedures

There are four general learning guidelines which have been developed and seem to apply to most if not all categories of learning. These general guidelines are:

1. Inform the learner of the objectives. The students are told exactly what is expected from them, exactly what they are expected to do, and exactly how they will be tested on the material that has been presented. The

better they understand what is expected, the more likely they will be able to perform adequately.

2. Provide for active practice. Active practice is a more specific term which has been derived from the more general "performance training" and "hands-on training." Effective training requires that the learner be given practice in the performance that he will be expected to exhibit at the end of training.
3. Provide guidance and prompting for the learner. Early in the learning activity, it is important for the learner to receive the necessary guidance and prompts so that he may continue his active practice. As skill increases, the amount of guidance and prompting reduces to the level that will actually be encountered in the job environment.
4. Provide feedback to the learner. Feedback is a fundamental concept in the ISD process. Feedback is best when it can be a natural by-product of the task performance. In this way the feedback can be virtually continuous. Sometimes it is necessary to provide a learning environment that is relevant but artificial. This often occurs in specially designed training devices and simulators. The third form of feedback is knowledge of results. Knowledge of results often occurs at the end-point in a performance and may take the form of hits on a target or some other direct record. It is often less desirable, because while it tells the results of the learning effort, it does not provide the learner with information

as to what can be done in order to improve. A fourth form of feedback is simply providing the student with a correct answer to the situation or problem he faces. He is then permitted to compare his answer with the correct answer. All these methods of providing feedback are not possible in all learning situations. Therefore, if the learning is to be efficient and effective, care must be taken to provide the specific type of feedback needed.

Earlier, objectives were divided into four categories: mental skills, information, physical skills, and attitudes. In this block, each of these learning categories is further divided into appropriate subcategories so that more specific learning events and activities can be specified. There is a total of eleven subcategories, each of which has a number of guidelines for the design of instruction for that category of learning.

Outputs

The outputs from Block III.1 include the classification of the learning objectives into their appropriate subcategories, the learning guidelines chosen for groups of learning objectives, and the learning events appropriate to the learning objectives.

Management Decisions

Since the procedures for specifying learning events and activities have been spelled out in sufficient detail for adequate analyses and classification, the manager is concerned primarily with reviewing the assignments to insure that the objectives have been correctly classified.

Incorrect classifications can result in inefficient learning and sometimes result in learning which is not effective. There are relatively few trade-offs to be negotiated, and resource allocation problems are ordinarily not encountered in this block.

BLOCK III.2: SPECIFY INSTRUCTIONAL MANAGEMENT PLAN AND DELIVERY SYSTEM

Introduction

The initial step in Block III.2 is the specification of the instructional delivery system. Media selection is a major means for determining how the instruction is to be presented to the student. The choice of the media mix has an impact on both the effectiveness and cost of training. A systematic approach to media selection requires consideration of the nature of the objectives, the learning category of each group of objectives, use of learning guidelines, and use of learning activities based on those guidelines. Because instructional requirements are different for different learning objectives, equipment and facility constraints, cost of procurement, cost of replacement, development costs, and the characteristics of the students must all be taken into account.

Based on the determinations made in this block, existing instructional materials will be examined in Block III.3 to determine whether they are suitable for instruction in a new situation. It will often be necessary to make some adjustment in the instructional delivery system in order to accomodate useful high quality materials discovered as a result of this search.

A second principle step in this block is the preparation of the system management plan which is the principal organizational document for the instruction. It indicates exactly how the instruction is to be conducted, how the students are to be managed, when and where they will be tested, what the instructors and other support personnel are to do, and how each of the many elements within the plan work together.

The system management plan is also used by the internal evaluator to plan and conduct the internal evaluation. It is usually necessary to develop the system management plan with the assistance and cooperation of the internal evaluator to be sure what is being planned can be properly evaluated.

Rationale

While the media and delivery systems are usually selected on the basis of equipment availability, local past experience, and available production facilities, there are other important considerations which should be taken into account to make better long range plans. Techniques have been developed for the projection of procurement and revision costs in a wide variety of instructional media. Frequently, there can be a large discrepancy between the projected costs of an existing or available delivery system and one which has been optimally designed.

Large discrepancies of this nature can often serve as the basis for management decisions to embark on a new approach to instruction when it can be shown that the new approach will have important pay-offs either in costs, time reductions, or increases in effectiveness. While it may not be cost effective to invest in a new delivery system for a single course of instruction, such an investment may have a significant pay-off over time. Data accumulated through time will provide an important source of information for management in making better long term decisions.

New delivery systems and techniques often become fashionable simply because they are available. In this block, procedures are defined

for selecting one or more suitable media for specific learning events and activities. By using this approach, delivery systems can be selected on the basis of defined requirements rather than on the basis of availability or the appeal of currently existing fads.

Inputs

The inputs to Block III.2 include:

1. The learning events and activities specified as a result of the effort in Block III.1.
2. The setting selection criteria and rationale developed as an output of Block I.5.
3. The analysis of existing course information developed in Block I.4.
4. Other documentation developed in prior steps, as needed.

Procedures

The first step is to identify a list of media mixes or alternatives. A media alternative is a form of instructional material that contains the stimulus criteria required by learning activity. Each of these correctly identified media alternatives becomes a candidate for possible use as part of the final delivery system. The learning guidelines may require a number of different forms of presentation such as visual, visual motion, high quality audio, etc. Those media alternatives which can meet these criteria are identified.

In the ISD manuals, a number of matrices have been developed which assist in correctly identifying media candidates which have the characteristics required to satisfy the learning guidelines. As the learning objectives are examined and classified, there may be an

indicated need for a specific medium, or there may be an indication that virtually any approach might be satisfactory. Both kinds of information are important because some forms of media are much less expensive than others. In those instances where two or more media can satisfy the learning guidelines, the decisions can be made on the basis of cost, availability, or other factors.

Once the candidate media have been selected, the management plan can be specified. The instructional management plan can be usefully divided into two general categories: those employing the group block scheduling mode and those using self-paced modes. Group block scheduled instruction has existed for many years in military training and probably is the most widely used.

More recently, through careful application of systems engineering or ISD techniques, self-pacing procedures have been found to be extremely effective. There are criteria in the manual which assist the instructional designer in selecting the mode of instruction. Because of the wide differences in requirements of each of the instructional settings, the management plan must be carefully put together to meet the requirements. For example, while group management plans are usable in a resident school, or perhaps an installation support school setting, they are far more difficult in a formal on-the-job training program. These factors are taken into consideration as the management plan is developed.

The role of the instructor must be carefully defined. With the increased use of other available techniques of delivery, it is no longer an absolute necessity to use an instructor solely in a talking or demonstrating mode. More recently, the job of the instructor has

increased in complexity to the point where he is more often thought of as a manager of instructional resources. This may mean special preparation or training and possible assignment of part of the instructional staff to provide the necessary support for the instructor in the manager role.

Finally, necessary facilities and instructional resources must be identified and specified. These instructional products must be classified as reusable or consumable; that is some of them may be retained by the student for his future use and others may be used up in the process of instruction.

Outputs

The outputs from Block III.2 include:

1. The system master plan which contains all of the specifications for people, resources, facilities, and other requirements.
2. The selected media and the media alternatives where alternatives are appropriate, and a summary statement of the rationales for the selections that have been made.

Management Decisions

The instructional manager will be heavily involved in the decision-making process in Block III.2 from the beginning. Virtually no decision is made in this block which does not affect a number of different departments, commit various resources, or have implications for the utilization of facilities and people. The manager must constantly be aware of the alternatives being considered and must be able to contribute to the decision-making process by providing information about

facilities, personnel, and other resource availability.

Because these decisions have extremely important implications for training efficiency and effectiveness, the manager must carefully weigh the alternatives within the context of the currently operating environment. Another important management function with regard to Block III.3 is the accumulation and systematic use of cost data for each of the media alternatives considered. While there are many cost models available, it is recommended that the manager become familiar with the cost accumulation techniques specified in the TECEP volumes. References for other cost techniques are included at the end of this block.

It may not be possible to make completely data-based decisions with respect to the trade-offs required in resources, cost, and effectiveness of the alternatives since cost-effectiveness information depends on valid and reliable data both on the cost of instruction and the outputs of instruction. However, it is possible to make generalizations from other similar situations in which people have researched various relevant questions about the cost and relative pay-offs of instructional alternatives.

Finally, the manager will have a heavy role in coordinating the decision-making processes which involve many other departments.

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Gay, R.M. Estimating the Cost of On-the-Job Training in Military Occupations: A Methodology and Pilot Study (R-1351-ARPA). Santa Monica: The Rand Corporation, April 1974.

BLOCK III.3: REVIEW/SELECT EXISTING MATERIALS

Introduction

Reviewing existing learning materials for the purpose of determining their potential value for use in the current training program is accomplished at this point. A careful search is made within and between services in order to locate as many candidate instructional materials as possible.

Having made a search and located potentially valuable instructional materials, these materials are reviewed specifically to see whether they meet the learning objectives established for the current training and whether they can be used or adapted for use within the context of the selected learning guidelines and media.

Candidate materials are selected or adapted for use where appropriate, and are rejected when they fail to meet the current needs. If suitable existing materials cannot be found, new materials must be developed according to the procedures outlined in Block III.4.

Rationale

The majority of training programs will not be totally new. Most of them will be additions to, changes to, or revisions of existing training courses. Even if the potential training is new to a given branch or service, there is a good chance that it might have been offered by another branch of the service before. In order to avoid duplication of effort and to take advantage of materials developed elsewhere, procedures are set up through which the organization which manages each DOS can accumulate a catalog and library of existing materials appropriate to that DOS.

Materials which do not meet specification exactly may often be used or adapted on an interim basis, while more suitable instruction is being developed. This practice will allow more immediate introduction of the training, and improvement can occur as newer materials are developed when time and resources are available.

Inputs

The inputs to the Review/Select Existing Materials block consist of:

1. Specification for learning events and activities which are outputs of Block III.1.
2. Specifications for the instructional management plan and delivery system, the output from Block III.2.
3. Specification of student entry behaviors, the output from Block II.3.
4. The list of candidate existing courses examined by the procedures outlined in Block I.4.

At this point, all prior documentation will be available for use, but the procedures described here will depend most heavily on the inputs described above.

Procedures

The following procedures will require facilities, people, and a reasonable amount of time for an adequate search and review to be made.

In order for an exhaustive search to be made, sources of information must be located and followed up. Local commands must establish SOPs which will enable the reviewer to communicate with other commands

to obtain the candidate materials. It will require some time to locate the people in the other branches or other services who have primary responsibility for the DOS in question. Frequently, brief telephone discussions can greatly reduce the amount of time and effort spent in reviewing material with similar titles but which may serve totally different purposes.

Once the materials have been collected and cataloged, the next step is to review the materials to be sure they match the learner characteristics, the learning guidelines, the instructional delivery system, and the management plan for the training being developed. Since one of the more important considerations in the selection of media and management plan is cost, the availability of existing materials can often have an important impact on that decision. Acquisition costs of existing materials can be dramatically lower than development costs for new materials, thus providing an incentive for consideration of existing materials.

Materials can be selected and used in their existing form or, if they have important contributions to make, may be adapted or revised to suit current needs. The reviewer, with the advice of specialists in media and materials can often make a quick decision about the feasibility of adapting existing materials rather than using them as they were produced.

A number of factors must be considered before deciding to modify existing materials. First, an important consideration is whether the need is going to be long or short term. It may not be economical to revise existing material for short term use. The physical condition and prior history of the materials can often be the deciding factor.

If the materials are not in good shape or if the masters are not available, revision or adaptation may be more expensive. Ordinarily more than one judge should be used for any piece of existing materials to be sure that all of the relevant factors are considered. This will almost always occur when the reviewer discovers candidate material and submits them to the training development committee for review.

The important rule to follow in reviewing existing materials is:

> Do not reject materials simply because they were developed elsewhere and do not accept materials simply because they are available.

Outputs

The outputs from this block are selected materials classified into two categories:

1. Existing materials that are adequate for use, as is, and
2. Materials which must be revised before they can be used.

Management Decisions

In order to obtain long term benefits from this block, it will be necessary for management to establish carefully monitored, local SOPs that can be readily followed in obtaining existing materials for review. Further, as these materials are accumulated they will require cataloging and storage in some form. Either the actual materials can be stored or a carefully written description of the materials can be filed and cross-referenced.

A second form of management decision will involve making the necessary trade-offs to decide whether existing materials can be used on an

interim or long term basis and whether it is worth the time and effort to adapt or revise them.

Significant factors in these decisions will be the time available for development, the resources available, and the potential for making improvement over existing materials by developing new ones.

Virtually every consideration in the management decisions in this block involve costs. Careful applications of the procedures can have very favorable cost results over the long term.

BLOCK III.4: DEVELOP INSTRUCTION

Introduction

One of the larger efforts in the ISD process is that of developing instruction to accomplish the specified learning objectives. At this point, all available off-the-shelf instruction has been selected and included. What remains is to complete all of the materials necessary to produce the desired results with the trainees. From Block III.2 the media and methods of instruction have been specified, and from Block III.3 the available materials have been collected and assembled. This is the appropriate place to produce all the additional instructional materials which will be used. The process includes developing first draft materials using the learning events specified in III.1. These first draft materials are tried on students and finally sent to the appropriate production specialists for development. A variety of approaches are available for use. The appropriate mix of these approaches will depend in large part on the available time and the facilities and resources available locally. Lectures, video tapes, slide/tape presentations, job performance aids, and formal on-the-job training are all developed according to the same general principles. The prescribed procedures allow for ample internal content review of the materials to insure that they are doctrinally correct.

Rationale

All ISD instruction is developed according to a common systematic approach. This approach is relatively straightforward and can be learned by those ordinarily assigned the responsibility for the development of instruction.

Fundamental to the process is the development of the minimum instruction necessary to accomplish the intended learning objectives. To achieve this end, a very lean approach to writing initial drafts is required. As the materials are tried with students, weaknesses and discrepancies can be identified, and, where necessary, materials can be expanded to overcome any shortcomings.

Available measurement techniques do not permit the easy identification of instruction which has more material than is required. Further, the elimination of already prepared materials is a more expensive process than the expansion of under-prepared materials. Here, tradeoffs must always be made between the most ideal way of approaching the instruction and the resources available to accomplish these ends.

Inputs

The inputs to the development of instruction block will be all of the documentation available from the processes thus far. Any or all of these inputs may be required in correctly applying the procedures.

Procedures

Once the materials have been organized and sorted according to those materials which are available and those which must be developed, it is necessary to separate the groups of learning objectives according to the selected media. In some instances, more than one form of instruction will have to be developed in order to accomplish the learning objectives.

The initial step in the preparation of materials involves preparing the first draft script or storyboard. These first draft scripts and

storyboards serve the purpose of informing production staff of the requirements for production.

For some materials to be developed, including those for formal on-the-job training and for job performance aids, the first draft script and storyboard may be replaced with a fully descriptive outline of the steps to be followed.

When a small amount of instruction on a learning objective has been developed, it is tried with a single trainee from the target population to see whether it is successful. Since these materials should have been prepared in the leanest possible form, the tryouts should reveal weaknesses and areas where additional instruction is required.

Outputs

The outputs from Block III.4 include all of the materials, procedures, plans, and media necessary to conduct the instruction.

Since the output of Block III.4 goes through the process described in Block III.5, VALIDATE INSTRUCTION, the final effort involved in Block III.4 will be to make the revision based on the data collected in Block III.5.

Management Decisions

Probably the most difficult area for management in developing instruction will be to coordinate the efforts of a variety of people in a number of different skills areas. Depending upon the media and method selected, the manager may be required to arrange for the production of video tapes, printed materials, audio materials, the development of training aids or devices, and any one of a number of other instructional approaches.

An almost constant process of trading off availability of facilities and resources, acceptable levels of the quality of the instruction, and the scheduling of completion dates will occur as progress in this block continues.

In many instances, it will be necessary for the manager to challenge decisions made earlier on the basis of the lack of facilities or resources, and the waiting time required to get materials produced, and in combination with the manager of the effort in Block III.5, make revision decisions or redevelopment decisions following test results.

Further, difficulties for the manager may occur when trying to get existing production personnel to produce materials according to the needs defined by ISD processes rather than according to the techniques and procedures previously used. It is not uncommon for media specialists to be more concerned with the appearance and style of the production than with its instructional effectiveness. Thus, the development manager must constantly be aware of the instructional requirements of the materials as opposed to the cosmetic appeal. Finally, as new materials are developed, the manager must insure that all developed materials are consistent and accurate in doctrine and content.

BLOCK III.5: VALIDATE INSTRUCTION

Introduction

The heart of the development phase is validating the instruction until the students who use it as planned meet the learning objectives. The validation process is probably the most powerful procedure in the entire developmental effort.

If the learning materials selected in Block III.3 and those developed in Block III.4 have been produced efficiently, they will have the minimum possible elaboration. The instruction should be "lean." When this material is tried on students for the first time, it should reveal some short-comings. Students ordinarily will find errors in the directions or will fail to understand or be able to meet many of the requirements. These inadequacies can be corrected through the process of revision. If on the other hand, tryout reveals only a few errors and difficulties, and students seem to grasp everything quickly, it will be extremely difficult to discover if the instruction has been overdone.

Selected members of the target population usually go through the materials individually at first and revisions are made on the basis of those trials. Following the initial revision based on individual student data, the number of students is increased in order to detect more possible errors. Finally, when the materials are thought to be complete, they are tested on enough students so that their effectiveness can be demonstrated at an acceptable level of confidence.

As the materials get better, fewer and fewer students will have difficulties, and more and more students will work through them to an

acceptable level of performance. At this point, the instruction is ready for introduction into the setting for which it was designed.

Rationale

Historically, when tests have been administered to students, the scores have been entered into the students records and ultimately decisions have been made about whether the student should be passed or retained. In some instances, these tests have been based on training requirements, and in other instances, they have been designed by the instructor to see which students have taken the time to learn the more irrelevant and obscure points in the course.

In the ISD process, there are no test items which are not directly related to objectives. Because of this, the test results can be used not only to determine if the student has passed, but also can be analyzed to see which of the instructional areas seem to be causing the most problems. Now, the same data that were originally used only to evaluate the students can now be used in an equally successful way to evaluate the instruction.

Analysis of this data points clearly to those areas of the instruction which require revision. The data identify the need for revision but only a combination of those familiar with the content of the course and the instructional designers will be in a position to decide what needs to be done as a result of the testing.

This validation (or formative evaluation) process can continue through as many trainees and revisions as are needed until the instruction is serving its intended purpose to an acceptable level. The validation process is suitable for all known forms of instruction.

Inputs

The inputs to the validate instruction block include:

1. The instructional material selected in Block III.3.
2. The instruction developed in Block III.4.
3. The tests developed in Block II.2.
4. Outputs and documentation from any of the other blocks required for analyses of the materials.

Procedures

Initially, it will be necessary to make a plan for conducting the individual trials. Materials will have to be collected, the tests must be assembled and ready, and the trainees must be available. It is common to collect performance data, questionnaire data, and in some instances interview data from students who go through the instruction.

When students are asked to complete questionnaires or to give their opinions about the materials, it is important to be sure that they are asked only those questions to which they have the capability to respond. Often, the students can describe what they like and do not like, but these opinions often are not consistent with their actual performance. Students often cannot make recommendations about what needs to be done to revise the materials, but they can describe the point at which they had difficulty or explain what it was that confused them.

Once the individual trials have been conducted, the data are analyzed by the instructional developers and revision decisions are made on the basis of the tryout information. If necessary, additional individual trials are conducted until the individual students have

discovered all of the obvious errors and difficulties. Following that, group trials are conducted. The term "group trials" does not necessarily imply that a large number of individuals must all be present at the same time. It simply means that further revisions will not be made until a specified number of individuals have been given the instruction and the aggregrate data have been analyzed.

In the manuals, tables are provided for the selection of the number of students required in order to determine whether the instruction has met the required standards. There is no magic number which can be used in all cases since confidence in the results is a statistical rather than an absolute determination.

In those instances where the objectives are extremely important or serve as the basis for subsequent important instruction, higher performance standards must be established than for those learning objectives which are independent or which do not represent critical instruction. Learning objectives must be classified by those familiar with the content so that reasonable standards can be adopted. If the standards are set too high, vast amounts of time and resources can be wasted trying to achieve unrealistically high standards. If the standards are set too low, large numbers of trainees will have to be recycled because the materials were not adequately prepared.

The best practice has been to consider the results of each objective based on the relative importance of that objective to the instruction as a whole. Different confidence levels may be selected for different learning objectives in a reasonable and systematic way with the result being that the instruction as a whole will meet planned expectations.

After the materials have reached their required standards of performance they are ready to be reproduced in sufficient numbers to serve the trainee population.

Outputs

The principal outputs of Block III.5 are the validated materials themselves. These would include all of the lectures, videotapes, printed materials and other instruction to be provided.

A second output of this block would include a description of the validation process followed and the results finally obtained with the materials. The second output is of principal interest to the internal evaluation function in Block V.1.

Management Decisions

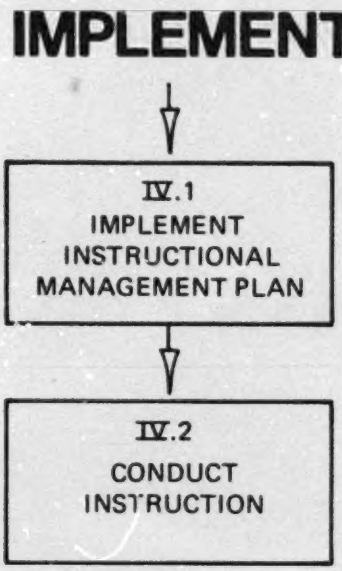
Block III.5 requires moderate to heavy management inputs and decision making. The manager must be concerned with ensuring that instruction has been developed which meets minimum requirements commensurate with available resources.

The manager will need to decide how many revisions of the materials can be undertaken and still meet the planned course schedule. The manager may also be called on to decide whether to complete the validation process prior to the time that actual trainees are exposed to the materials or whether to use actual trainees in the validation process. In part, his decision will be based on the availability of the necessary members of the target population and the amount of time available. If new trainees must arrive before validation processes can begin, revisions to instruction may have to occur following the initial use with trainees. While this is not the most desirable course of action, the same end result can be achieved through continuing revision.

An extremely important management function in this block is that of insuring that the revisions made are necessary and that the data have been carefully analyzed and interpreted before these revisions are made. Frequently the "easiest" solution is simply to add more materials without adequate analyses of the problem. The manager must constantly guard against this tendency to add material when it may not be necessary.

It will be a continuing duty of the manager, in working with those who develop materials, to convince them of the necessity of developing barely adequate materials in first draft form. The reason for this requirement is that it is extremely difficult to identify materials which have been over developed, but it is simple to identify materials which are inadequate. Finally, the manager must insure that the trainees used in the validation process are truly representative of those for whom the instruction is being designed. Revisions and adjustments in the instruction are made on the basis of data collected from the trainees used. If these trainees are incorrectly selected, bad revision decisions inevitably result.

PHASE IV:


IMPLEMENT
IV.1
IMPLEMENT
INSTRUCTIONAL
MANAGEMENT PLAN
IV.2
CONDUCT
INSTRUCTION

BLOCK IV.1: IMPLEMENT INSTRUCTIONAL MANAGEMENT PLAN

Introduction

The instructional portion of the system management plan which was developed previously according to the procedures outlined in Block III.2 is now ready for implementation. A complete instructional program should be available which includes clear statements of what is to be accomplished, how it is intended to be accomplished, and how it will be determined whether the plan was accomplished. Refinements and additional details will be necessary to complete the evaluation plan.

Any additional or revised requirements that have come about due to the validation procedures in Block III.5 may be made to the instructor's manual. Here it is necessary to select, assign, and train instructors in any of the techniques or procedures with which they are not familiar. Ordinarily, only instructors who are successful graduates of regular instructor training schools would be selected. It is not the intent of this block to give details of how to train instructors.

The implementation of the instructional management plan occurs just prior to the time that the first students are actually processed into the instruction and the space, equipment, and other resources are obtained. Activities involving students occur in Block IV.2.

Rationale

While it appears that the implementation of the instructional management plan occurs at a fixed point in a linear sequence, the actual

planning and development has been taking place for some time. The implementation of the management plan is the terminal step in planning and preparation just before regular instruction begins. Instructional management plans will vary considerably from those involving typical resident school instruction to those involving remote formal on-the-job training programs. No single plan will serve all purposes.

It is at this point in the process that any discrepancies or deficiencies in what has gone before will be identified and corrected prior to the time that the students begin work in the course.

Inputs

The inputs to the Implement Instructional Management Plan include:

1. The instructional management plan developed in Block III.2.
2. All of the materials, procedures, tests and other necessary components of the total instructional program.

Procedures

The first thing that will need to be done is to make a complete inventory and checklist to be sure that everything necessary for the implementation of instruction is available. If necessary, at this point, changes, additions, and deletions should be made to the instructors' manuals and students' manuals to insure that they are completely up to date.

It must be made absolutely clear exactly what the instructors are supposed to do, when they are supposed to do it, and any specific or unique requirements which they may be required to meet.

For the students' manuals, all of the necessary exercises, instruction, directions, and other requirements should be completed or modified if necessary.

The next step is to identify those instructors who are going to be involved in the implementation effort and to provide whatever additional training may be necessary to carry out the instructional plan. Most often, this involves rehearsal and review of the uses and functions of equipment to be used, practicing demonstrations, or rehearsing test administration when tests have unique features.

Finally, the procedures become administrative in nature: time and space must be secured, all of the necessary facilities and equipment must be secured, everything necessary to the operation of the course should be checked to be sure that it is in safe working condition.

When this has been completed, instruction is ready to begin.

Outputs

The outputs of this block include all of the materials, equipment, and other items necessary for the operation of the course, staff which has been trained to operate the course, and specific instructions to be followed by each person in the implementation effort.

Management Decisions

Much of the effort required by management in this block will be a part of efforts begun earlier. There is often a frenzy of activity which occurs just prior to the deadline. The manager will ordinarily find himself heavily involved in a wide variety of decisions which must be made and executed prior to the time that students arrive.

Planning for every possible contingency might require more time than simply managing and solving the problems at the last minute. Many of the problems to be solved at this point will have relatively straightforward solutions.

The manager should expect to be constantly available to those who need him during those weeks and days just prior to the implementation of the new instruction. Timely decisions at this point can have a dramatic impact on meeting the deadline.

BLOCK IV.2: CONDUCT INSTRUCTION

Introduction

This is the first of four continuing steps in the ISD process. This block is followed by internal evaluation, external evaluation, and revise system. These four functions occur continuously so long as there is need for graduates from a course.

Each command using these procedures will have already established instructor training programs which provide the necessary skills for usual instructional activities. In addition, in Block IV.1 any special instructor training would have been conducted. At this point, what remains to be done is to conduct the instruction according to the instructional management plan. The instruction can be conducted in resident schools, installation support schools, formal on-the-job training, self-teaching exportable packages, or whatever was specified for meeting the intended objectives of the course.

As the instructor is provided with more and more resources and training in their use, his role increases beyond that of traditional classroom presentations to include that of an instructional manager. In self-paced and other nontraditional courses, the role of the instructor will be even more vital to the attainment of the objectives.

The instructor will manage resources, make presentations, administer tests to students, record data, and make recommendations for improvement to the instruction.

Working in cooperation with the internal evaluation group, the instructor will help evaluate the students and the instruction.

Rationale

The rationale for the Conduct Instruction function is very straightforward. The instructor in direct contact with the students will make presentations, give demonstrations, provide the students access to the learning resources, administer tests, and keep whatever records are necessary. It is the instructor's job to make the instruction work and to keep detailed records of any problems that are encountered.

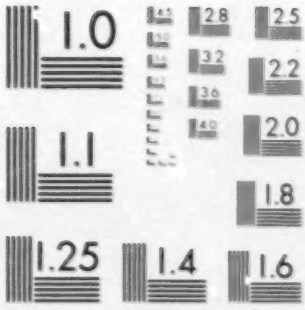
Inputs

The inputs to the Conduct Instruction function include all of the instructional materials prepared in the prior steps, all of the required facilities and resources, instructors' manuals, and all of the tests, rating scales, questionnaires, and procedures defined in the instructional management plan.

Procedures

The procedures for conducting instruction will depend principally upon the selected instructional setting, the methods and media chosen, and the management plan within which the instruction will operate.

The instructor may be required to make presentations, give lectures, give demonstrations, interview students, provide tutorial assistance, administer performance measures and other forms of tests, and provide inputs to the internal evaluators regarding all the elements of instruction with which he has contact.



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Outputs

The outputs of the Conduct Instruction function include:

1. Students who have graduated or completed the instruction as required.
2. Specific ratings or evaluation of the instructional material or procedures.
3. All of the data collected as a part of the Conduct Instruction function including student test results, student ratings, student critical incident reports, student time records, and other data upon which the course revision and operations decisions will be made.

Management Decisions

Managing the instruction is a function in which there is already considerable management experience and expertise. SOPs and other guidance exist in all commands indicating how the instructional manager should proceed with his duties.

In addition to the traditional administrative requirements of making sure that all the instructors perform as expected, the manager of instruction in self-paced, peer-tutored, computer-assisted, and other nontraditional forms of instruction will often find his role expanded to include:

1. Counseling and reassuring instructors who are unfamiliar and uncomfortable with newer instructional techniques.
2. Providing encouragement and support to those instructors who continue the efforts as planned until sufficient data can be collected in order to make reasonable revision decisions.

3. Meeting regularly with the internal evaluation group to coordinate data so that evaluations can be completed and revision decisions can be made.
4. Insuring that there are sufficient learning materials and resources available, and that there is adequate time to complete the instruction as planned.
5. Managing the personnel and physical resources with constant attention to ways in which resources and facilities can be saved and personnel resources can be freed from more routine duties to make their time available for other necessary ISD functions.

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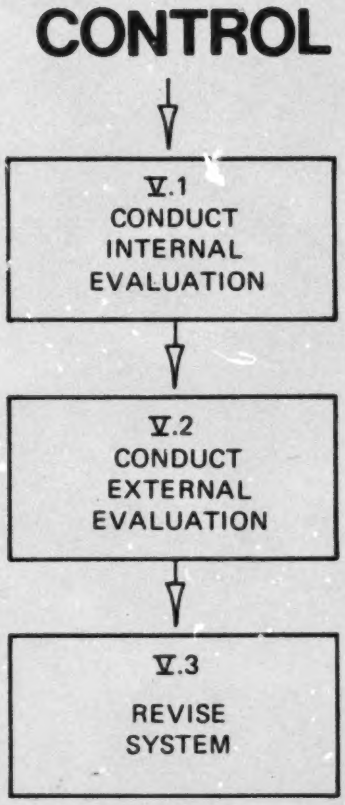
CONTROL
V.1
CONDUCT
INTERNAL
EVALUATION
V.2
CONDUCT
EXTERNAL
EVALUATION
V.3
REVISE
SYSTEM

BLOCK V.1: CONDUCT INTERNAL EVALUATION

Introduction

Internal evaluation is planned and conducted primarily to determine whether the ISD course development effort has been accomplished. Data are collected not only to assess student progress but also, more importantly, to assist in improving the quality of instruction. The principal question to be answered in internal evaluation is: Is the instruction providing the students with the necessary knowledge and skills to meet the objectives in a satisfactory manner?

In addition, the other aspects of instruction are carefully examined. To what extent did the development effort conform to an acceptable ISD procedure? How much time was required for the student to complete the instruction? Was the prerequisite information and entry test data used appropriately? Did the instructional personnel and test administrator perform in a way that was consistent with the management plan, instruction, and testing procedures?

It is the duty of the internal evaluator to collect as much useful information about the operation of the course as possible in order to increase the chances of making greater improvement through time. The evaluation process consists of collecting pertinent progress and process data, performance data, and information from students, instructors and other personnel, evaluating their data, and making recommendations.

Rationale

Two evaluation functions are recognized in the control phase of the ISD process. The first of these, internal evaluation, must provide

the basis for deciding whether the course met its planned objectives. In addition, time data and other information from students are collected to provide the basis for making revision decisions.

Evaluation is not unique to the ISD process, but no set of instructional design and development procedures can be called ISD unless it includes an adequate internal evaluation.

Ideally, the internal evaluator would be assigned to a department not directly responsible to the instructional design, development, or delivery system manager. The more independent the evaluator can be, the more accurate and useful his data will tend to be. An impartial evaluator will be in the best position to verify that correct procedures have been followed in obtaining the results of instruction.

It is the evaluator's purpose to remove as much of the guesswork as possible from school operation. By careful analysis of the evaluation data, a determination can be made as to the problems with the instruction, and appropriate revisions can be made.

Inputs

The inputs to the Conduct Internal Evaluation block include:

1. Output data from each of the blocks in the model.
2. The data collected on the performance of the student including:
   a. The results of the tests,
   b. The time required to complete,
   c. Student evaluative data, and
   c. Instructor evaluative data.

Procedures

The first step in the internal evaluation function is concerned with the development of the internal evaluation plan which was required in Block IV.2. ISD procedures cannot be totally sequential. That is, having an evaluation plan prior to the conducting of instruction is necessary if appropriate student and instructor data is to be collected.

A part of the internal evaluation plan is the progress evaluation plan. The progress of the development of instruction is monitored to be sure it is consistent with the required procedures and whether or not the effort is on schedule.

A process evaluation plan is prepared in which the evaluators will check the actual procedures and outputs of each of the blocks to be sure the processes are consistent.

An extensive documentation checklist is provided so that the internal evaluator can compare the required outputs with the actual outputs of each of the blocks.

Each of the areas of student evaluation is spelled out in detail. Course requirements are compared with student entry behaviors and a number of evaluation designs are considered in order to answer specific questions about the instruction. The evaluator must determine whether the students are being given instruction on topics they have already mastered, or whether they are being given instruction for which they did not have the entry skills.

Extensive student questionnaire and instructor questionnaire data are collected to pinpoint the good and bad aspects of the instruction.

Procedures are established for determining whether students satisfy the terminal requirements fo the instruction, and evaluation designs are used to isolate specific problems within the course.

Outputs

The outputs required in Block V.1 include the following:

1. Complete summaries of student records containing pertinent information on the students who took the course.
2. The internal evaluation report containing at least the following information:
   a. The degree to which the ISD process was followed, including documentation of any exception.
   b. The developmental time and resources required to produce the instruction.
   c. A completely detailed and a summarized presentation of student performance data organized by terminal learning objectives.
   d. A summary of the major inputs from the instructors including the analyses made of the critical incident reports of questionnaires.
   e. A summary of the complete findings, their interpretations, and specific recommendations for revisions based on those findings.

Management Decisions

Probably the most difficult task for the manager who must see to it that the internal evaluation is done properly will be to establish a good working relationship with other managers and involved personnel. There is often a very real concern among personnel whose responsibility it is to design, develop, and deliver instruction that the evaluators are primarily concerned with placing blame. To increase the likelihood that his job will be successful, the manager must establish a good working relationship with other departments and must be convincing in offering assistance and interpreting evaluative results. It is not the purpose of internal evaluation reports to place blame on any department or any individual.

The evaluation is primarily the basis upon which instructional accountability is based. Thus, the manager should make a diligent effort to be objective in the collection and interpretation of results and should base his decisions and recommendations on the collected data. The job is primarily one of determining whether the instruction met the expectations. Thus, it is primarily the results of instruction with which he must be concerned rather than the processes of instruction.

The manager of the internal evaluation effort will be heavily involved in the development of the evaluation plan, particularly in the progress evaluation plan since this information will often be very important to higher levels of management. There will be many tradeoffs required in attempting to obtain the most useful evaluative information within the available resources.

Finally, the internal evaluation manager will be required to present and defend his conclusions about the performance of the instruction. This will ordinarily take place in a meeting with all the other managers.

BLOCK V.2: CONDUCT EXTERNAL EVALUATION

Introduction

External evaluation is conducted in order to determine whether the output of the instruction in the form of trainees who have been sent to the field is serving the needs of the using command. The external evaluator provides the fundamental data for quality control. Those students who have met all of the instructional requirements are followed into the field either physically or by questionnaire. Performance is then determined by job performance measures, and supervisors' evaluations are taken into account.

Ideally, the external evaluator would base his conclusions principally upon actual job performance as measured by the JPMs produced in Block I.3 of the ISD model. Often, because of scheduling problems, DOS testing, and other similar difficulties, some data will have to be collected in another way.

Finally, the external evaluation report is prepared. It contains the conclusions and the data upon which the conclusions were based. Recommendations for any necessary revision are included in this report.

Rationale

External evaluation is required to be sure the graduates or completers of the instruction meet the expectations of the using command. These expectations should have been initially determined in Block I.1, ANALYZE JOB, and Block I.3, CONSTRUCT JOB PERFORMANCE MEASURES. If the job has been carefully defined, the appropriate tasks selected for instruction, and the job performance measures are consistent

with performance recommendations, the job of the external evaluator will be greatly simplified.

While it is normally easier to evaluate the products of a course in a resident or installation support school, evaluation of the use of job performance aids is also relatively straightforward. The requirements to provide external evaluation on the performance of students who have been in formal on-the-job training or have used self-teaching exportable packages becomes more difficult.

The external evaluator should also make recommendations for improvements in the instruction which will have important payoffs to the using command.

Inputs

The inputs to the Conduct External Evaluation block include:

1. The internal evaluation report (or the available internal evaluation data).
2. The output of Phase I including all of the job analyses, task selection, job performance measures, and setting selection information.
3. Any documentation from management or higher headquarters which has the effect of changing the requirements of the course.

Procedures

The initial step in conducting an external evaluation is the development of an external evaluation plan. The plan will include the specifications for the activities that will be undertaken in order to obtain data from trainees who have received the instruction,

and from appropriate supervisors and managers. To the fullest extent possible, the plan will call for the collection of real performance data collected as a result of the administration of job performance measures, and other indicators of performance which might include such things as advancement.

Either by interivew or by questionnaire, trainees who have completed the program will be asked:

1. How well they believe they are able to perform the job
2. The kind and amount of training received since arriving on the job
3. How well the instruction prepared them for the job
4. The portions of the instruction which were relevant to the job
5. Which tasks seem to cause the most difficulty

From the supervisors of graduates, information will be collected such as:

1. How well the graduates are performing on the job
2. How those graduates compared to those who received another form of training
3. In which areas the graduates were inadequately prepared

From other sources, including an evaluation team, the following information will be collected:

1. How well graduates scored on the job performance measures
2. Which JPMs gave them the most trouble
3. How well the JPMs were administered
4. How well the supervisor knows his job

Ordinarily, it would not be useful to contact someone who has received training until after he has been on the job for a period of thirty (30) days or more. This may not be a necessary criterion when formal on-the-job training is the means of instruction.

If questionnaires are to be used, they must be developed and tried out on a limited number of individuals prior to the time they are sent to all of those persons who received the training. This initial tryout will eliminate some of the problems and confusion with the questionnaire. Questionnaire data is far more dependable if a large percentage of the questionnaires mailed out are returned. A method for obtaining a high percentate of questionnaire returns should be worked out as a part of the external evaluation plan.

If personal interviews are to be used, those who are going to do the interviewing will be required to spend some time going over the interview form and in necessary training and orientation of proper techniques of interviewing.

Once the information has been collected about the performance of trainees on the job, it will be necessary to analyze the data to draw conclusions, and to make recommendations based on those conclusions. These recommendations will ordinarily be in the form of suggestions for revisions or changes in the instruction, although many of them will be concerned with aspects of job analyses and selecting tasks for training.

Outputs

The output from the Conduct External Evaluation block is the external evaluation report which contains the summaries and interpretations

of the collected data, the methods and techniques used to collect the data, the problems encountered and other information which will be useful to management in making the decisions about revisions to the instruction.

Management Decisions

Management decisions in the external evaluation function are of two general classes: short term and long term. In the short term, the manager will be principally concerned with reviewing the alternative data collection procedures and trading off the evaluation needs with the resources available. One of the more important assignments for the manager of external evaluation is to be sure that the quality of the data collected is as high as it can be. If course revision decisions are going to be made on the basis of the data, it must be the best data that can be obtained.

The manager may wish to consult evaluation specialists in order to be sure that available state of the art techniques are employed to collect this information. This would be particularly true in the construction of questionnaires and other evaluative instruments as well as the evaluation design to be employed.

In long term evaluation, the manager will be concerned with increasing the capability to collect and use external evaluation data. In some commands, the return rate of questionnaires is very low. Decisions based on low return rates of questionnaires ordinarily cannot be as good as those based on higher return rates.

The manager also may be concerned with attempting to develop an external evaluation plan to review the performance of all individuals in a DOS in order to segregate the relative contributions of the

various forms of training. It is the external evaluation data which ultimately will be able to serve as the basis for cost-effectiveness studies when comparing training settings. In order to achieve this end the manager may wish to request assistance from researchers and evaluation specialists in establishing an optimum evaluation system.

BLOCK V.3: REVISE SYSTEM

Introduction

At the completion of the preparation of the internal and external evaluation reports, the data contained in those reports must be used as the basis for deciding which elements of the system require revision. The internal and external evaluation reports will document course performance on an internal basis and the external evaluation report will have documented the results of graduates on the job.

A careful analysis must be made of the data contained in the reports in order to determine the need for revision. Revision needs occur as a result of changes in doctrine, procedures, weapons systems, or other major external change as well as the results of the performance of the instructional program. Revision can occur in any part of the system. Revisions can be undertaken to improve performance of the students, to reduce student time required to complete the instruction, or to try to retain the appropriate level of effectiveness at a lower cost. Estimates of the potential benefits of revision are made on the basis of the evaluation data. The specialists within each of the departments concerned with revision decide upon the tradeoffs which need to be made in order to make the revision worthwhile.

Rationale

Data based system revision undertaken as a result of careful consideration of the alternatives is the heart of the ISD process. The

ability to make good data based decisions is dependent upon the quality of the data collected and the care with which appropriate conclusions are drawn from that data. It is ordinarily through the revision process, particularly the early revision cycles, that some of the great payoffs from the ISD process can be realized.

An extremely careful effort must be undertaken to establish the basis for comparing instruction after revision with prior operating data. Since comparative data are ordinarily stated in terms of percentages of increase or decrease in time efficiency, percentages of increase or decrease in effectiveness, or increases or decreases in dollars, these numbers must be adequately documented and compared in order to draw appropriate conclusions from the results.

Inputs

The inputs to Block V.3 include the following:

1. The internal evaluation report
2. The external evaluation report
3. All prior course documentation needed
4. Necessary external inputs which may arise as a result of changes in the personnel system or other sources external to the instructional setting.

Procedures

The procedures to be followed include the following:

1. Determine the need for revision based on:
   a. Changes in doctrine, content, new system requirements, personnel changes

b. The results of the internal evaluation report indicating some deficiency.

c. Results of the external evaluation report indicating graduates are not able to do the job

d. Changes in training requirements or resources which require changes in the instruction

2. Determine what needs revision. It is absolutely essential that a careful analysis of the problem discovered in the internal or external report be made prior to the time revision is undertaken. It is possible, based on uncertain or preliminary data, to make costly and unnecessary revisions to perfectly good instruction.

3. It is important to make a careful analysis and projection to determine whether the investment required to decrease the time or increase the effectiveness of instruction is really worthwhile in terms of the potential benefits to be obtained. Any resources invested in making changes to existing instruction necessarily means that other aspects of the program must have their resources reduced or denied. It is very important that a clear justification exists for revision before it is undertaken.

4. Preparation of the revision plan. The revision plan should be put together as a result of conferences that have been conducted with the affected departments. If revisions are to be made in the media, the course management plan, the job analysis, or whatever section of the system that requires attention, those who must be charged

with the accomplishment of the revision need to have the opportunity to discuss the problems and potential benefits, cost, and time involved in making the revision.

5. Once the revisions have been made, it is essential that a follow-up activity ensure that the expected benefits from the revisions have actually occured.

Outputs

The outputs from the Revise System block include the following:

1. A complete revision plan outlining the requirements for revision agreed upon among the affected members of the staff
2. A revision progress plan in which the planned revisions are compared with the actual revisions in order to be sure that they are being undertaken and completed.

Management Decisions

Block V.3 represents one of the more significant areas in the IPISD for management decision. All or part of the instruction may require revision. Job data, task selection procedures, JPMs, and settings may all require serious review.

The manager must decide what to revise in the context of considering total resource allocation and scheduling problems. Within any pool of resources, allocating a portion of them to revision means that amount cannot be used for new course development. Often, the data is very clear and the decisions can be made with confidence. Equally often there will be inconsistencies in the data and the inferences

will not have the same level of precision. The manager must continue analysis until conclusions can be reached and a course of action agreed upon.

LOCAL INITIATIVES

There are two predictions about the local school reactions to the IPISD program which can be made with some degree of safety. First, that the IPISD procedures are either a little or a lot different than what is being done at the school now, and second, that there will be a number of specific reservations associated with the implementation of IPISD at the school.

Past experience has indicated that schools are often required to follow the letter rather than the intent of the procedures, particularly when these have been promulgated by regulation. It is the intent of the IPISD implementation plan that the spirit of the procedure is far more important than the letter. This is a troublesome notion because the difference between letter and spirit often can be detected only by those who are thoroughly familiar with the procedures. There are approaches which appear on the surface to be approximately equal and which have been shown to be quite different.

A second reservation is that of becoming involved in excessive paperwork, forms, and reporting requirements to the detriment of the course development effort. It has been a specific objective in the design of the procedures in these manuals to avoid specifying non-essential forms and reporting requirements. Experience with the program in the services is more likely to result in a realistic determination of essential reporting requirements.

A third reservation is that suspense dates for implementation of new programs are often too close for reasonable compliance. It is expected that IPISD will take considerable time and effort for proper

implementation. Experience with it will probably provide the best indicators of when the procedures should become completely institutionalized. Further, because the IPISD approach is somewhat different than the traditional, it will take time and resources to train enough people to perform the work in accordance with the IPISD specifications. Time must be provided for adequate training.

Because the procedures in the Model are different from many current practices in most schools, some resistance can reasonably be expected. Common questions like, "what's wrong with what we're doing now," and "we tried that and it didn't work," will be encountered. Experience has shown that as people become more familiar with the ISD approach and use it as a procedure to accomplish specific goals, the resistance to its use declines. Often, sufficient training changes opponents to supporters. Probably one of the more general fears will be the lack of adequate staff to continue the existing work and to take on the additional tasks of implementing IPISD at the same time; however, implementation of IPISD is not an additional task which will be separately funded. It is an evolutionary process which will ultimately replace current practices. The difference between what is being done now and the IPISD approach will have to be overcome through time as resources are reallocated to accomplish the change. The implementation is planned to be accomplished through the reallocation of existing resources rather than the addition of new resources.

Spirit of the Model

It is a distinctly stated objective of the interservice implementation program to try to avoid making the IPISD program a paper exercise. The

procedures and techniques are too valuable to be ignored or rendered ineffective by absolute compliance to rules.

There are several principles and concepts which underlie the IPISD Model. It is these concepts, principles, and rules which define the basic intent of the Model. These are as follows:

1. The complete and full use of the management information system must be taken in order to arrive at clear data-based decisions about instruction. These decisions should range from defining what it is that is to be taught, to how it is to be taught and how it should be evaluated.
2. A sound rationale for these decisions is based on established principles of ISD. If current practices are not defensible in the context of an ISD approach, they should be seriously brought into question.
3. Basic to any systems approach model is the generation and consideration of alternative approaches and solutions to a defined problem. These alternatives should include instructional strategies, testing procedures, delivery systems, and student management systems. The selection of the optimum alternative is one principal goal of the systems approach.
4. Optimizing course effectiveness and time are basic goals of IPISD, and instructional decisions need to be made on the basis of sound cost estimates.
5. Fundamental to the IPISD process is a revision procedure which requires that any course be revised based on usage data collected internally or on follow-up data, particularly if the course has failed to meet its stated objectives.

If these basic principles and practices are followed, good implementation of the spirit of ISD will occur. Following the specified procedures will not always yield a good solution to a problem without that element of judgment which is the final determiner of what is feasible or not feasible.

Realities of Implementation

The IPISD program does not provide specific procedures for every instructional situation that can be encountered. Some situations are covered only by the general principles underlying the Model. It is expected that local applications of procedures will extend the Model. to cover local requirements.

Finally one of the more difficult problems of all is that IPISD will tend to reveal shortcomings of current practices in local situations. When these shortcomings appear, many people will resist change and will argue against the implementation of alternative procedures. This kind of reaction must be taken into account and planned for in advance. Remember that the current system once was new, but eventually became established and institutionalized. In time, the IPISD procedures also will become institutionalized.

Reducing Costs

Within the model, there are procedures which tend to have much greater implications for the trade-offs of effectiveness, time, efficiency and cost than others. A prime example of a high payoff area is the process of selecting tasks for training. Any task selected for training will continue to accumulate costs for a long period of time. Therefore, it is absolutely essential that a rigorous procedure

be established for selection of tasks for training. Any task that can reasonably be eliminated has the potential for allowing great savings.

Another example of a high payoff area lies in the instructional management plan and delivery system. Careful matching of the management plan and delivery system can lower the internal costs for achieving certain objectives. The relative payoff of each of the steps in the Model is described in more detail in the section dealing specifically with that step. Remember, controlling unnecessary costs is one of the more certain ways to promote real economies.

Management of ISD

The implementation and use of IPISD procedures will probably require changes in existing management planning and decision-making procedures. These changes will be particularly noticed at the local school level. Using ISD has effects on both the resource allocation and supervisory functions of management.

As with most other functions, long term planning in ISD can be expected to result in considerable improvements in payoffs. Because many of the functions called for in IPISD represent professions in and of themselves, a strong commitment to organizational development will be required to meet the long term needs. For example, job analysis, measurement, selection of media, and cost effectiveness analysis are all extremely difficult and complex fields. Developing a local capability to work in these areas can have a very high pay-off for local commands.

Because of the specific nature of many of the functions of ISD, the manuals have been functionally organized to provide the maximum

flexibility at the local level. While a series of steps are called for in the development of any instruction, the IPISD Model does not specify what kind of organization is necessary to perform those steps. Further, the Model often provides alternative approaches to the same goals. By carefully articulating the strengths and weaknesses of the local school, the manager can improve the total performance.

Finally, by taking into account all the specific management decisions previously described in the Block Summaries it is possible to continue the improvement process through time.

Where to Begin

Any school manager who has as his responsibility the administration of a large number of courses is faced with a difficult problem of selecting and establishing priorities for courses to put into IPISD. Obviously some courses will not be discretionary, they will simply be required by a higher command. This section deals with the use of discretionary resources in local commands.

One criterion for the selection of courses would be to estimate the potential payoff to the school if the course could be improved. Here, payoff refers to the establishment of an increasing pool of discretionary resources. If it were possible to teach a basic course with fewer people after IPISD than was required before, the reassignment of those people to other important tasks would be possible. One payoff then is to organize the IPISD effort so that the maximum number of discretionary resources are realized.

One of the more obvious places to look for these high payoff courses is in the area of "high flow - high level" courses. These are courses

for officers, senior enlisted technical course, etc., where the individuals likely to be in the course have good academic skills. At the opposite end of the continuum would be a low flow course for trainees with limited academic abilities.

Another consideration might be to select a course which has a high flow but which for one reason or another has not produced graduates who are satisfactory to the receiving commands. In this case, the objective would be to improve the performance of the graduates, prior to attempting to realize cost or time reductions.

The decision to proceed with ISD development of a course must be carefully reviewed. The expected outcomes must be specified and subjected to a critical analysis. First, is it reasonable to believe expected accomplishments can actually be achieved? Second, if the objectives are achieved, will it really make a difference in the school or recieving command:

1. Will it reduce time?
2. Will it be less costly?
3. Will performance meet field expectations?
4. Will it use fewer resources?

In planning IPISD courses, careful problem analyses must be made to be sure that the course is planned and designed to meet the expectations for it. In order to realize cost savings, it is necessary to specify in advance as one of the planning constraints of the course that costs should be reduced. Unplanned cost savings are rarely realized. If it is the purpose of the IPISD effort to reduce the time in the course, again this must be specified in advance so that the instructional developers and designers can know ahead of time that the intended outcome

is a reduction in time. Knowing these requirements will prevent the developers from possibly designing into the course less costly but more time consuming activities for the trainees.

Management Information System

One of the major functions needing direct management attention in IPISD is the development and organization of the management information system. Because management information for IPISD instruction differs significantly from management information for more traditional instruction, it must be developed and presented in a usable way. Further, inducement must be provided to others to respect and use the data which is gathered. One planned expectation of the IPISD effort is the reduction in the number of decisions which have to be arrived at by guessing and an increase in the number of decisions arrived at based on reasonable conclusions which are based on carefully collected data.

The kinds of information that can be most valuable to management include the information gathered about the job, the task list, the criteria used to select tasks for training, the data used to select the setting of training, the performance of the trainees in each of the subsections or subunits of the course, etc. If these data are collected and properly interpreted, this can vastly increase the precision with which one can manage schools.

Training Setting Cost Model

Fundamental to training setting decisions and also to media decisions is reliable and accurate cost information. Because there are so many variables which affect the cost of training in any setting or

media, it will be necessary to develop appropriate cost information as these costs can be established and verified.

The Navy's Training Analysis Evaluation Group has been working for a number of years on appropriate media selection and training setting costs. The basic document summarizing these procedures entitled, A Technique for Choosing Cost Effective Delivery Systems (TECEP) is available for use. This document can be used by local managers either in its current form or as adapted to local requirements as a basis for generating appropriate training cost information. This data will be needed in several of the steps in the Model, particularly in Blocks I.5, III.1, and III.2. In those blocks, specific reference is made to the need for obtaining and comparing alternative costs for different training approaches. The recommended procedure is that the technician who is preparing the recommended approach should do so based on training criteria, and when these are complete, they should be negotiated with appropriate managers in order to be sure that the best cost tradeoffs can be made.

As experience in IPISD accumulates, more and better cost information will allow more cost effective decisions to be made.

Historically, training costs have typically been calculated on a "training/man-year basis." While this was an appropriate procedure for the more traditional forms of training, man/year costs do not take into account the increased productivity which often results from successful application of ISD. Future cost models for ISD-type courses must take into account the unit output cost in contrast to the man/year costs.

Regardless of the cost model selected by your local command, costs

for each of the appropriate categories outlined in the TECEP model should be accumulated and prepared prior to the time that setting selection for media decisions are made.

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